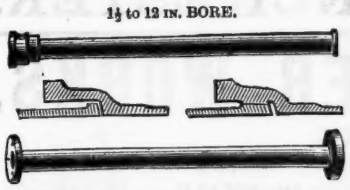
THE JOURNAL OF GAS LIGHTING
WATER SUPPLY & SANITARY IMPROVEMENT

VOL. LXVI. No. 1690.] LONDON, OCTOBER 1, 1895. [47TH YEAR. PRICE 6d.

GAS AND WATER PIPES

1½ to 12 IN. BORE.



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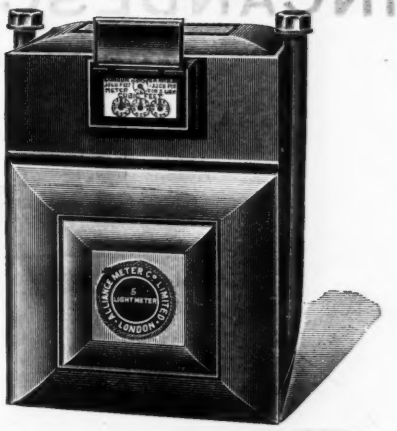

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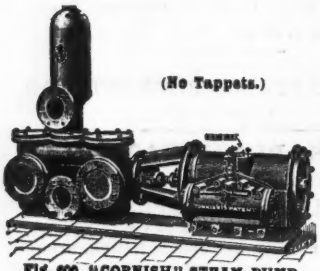

Fig. 600. "CORNISH" STEAM-PUMP FOR WATER.

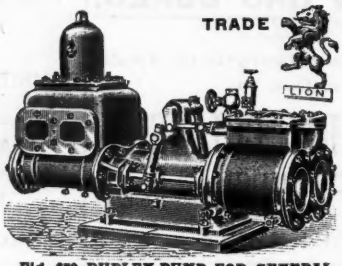

Fig. 670. DUPLEX PUMP FOR GENERAL PURPOSES.

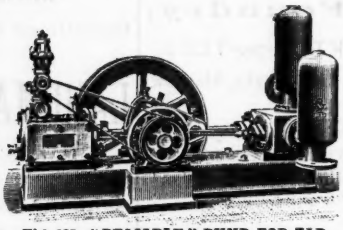

Fig. 685. "RELIABLE" PUMP FOR TAR AND THICK FLUIDS.

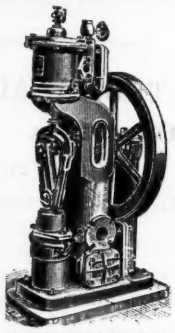

Fig. 705. SINGLE RAM PUMP FOR BOILER FEEDING, &c.

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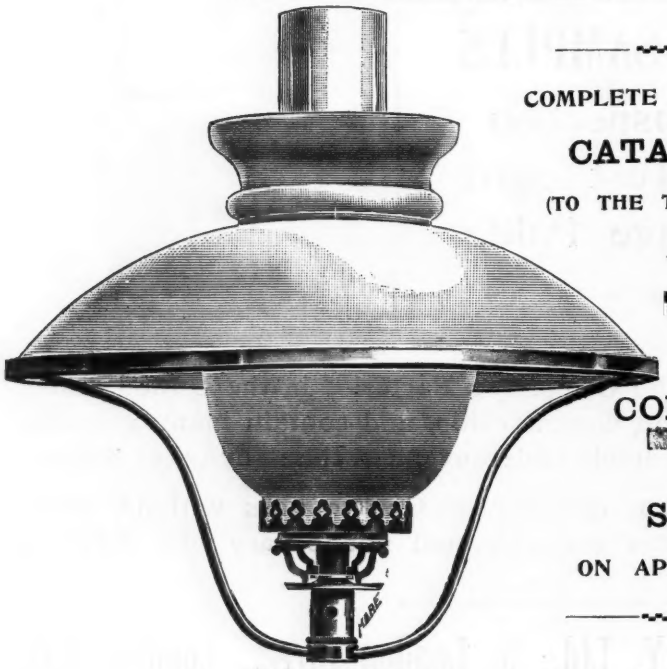

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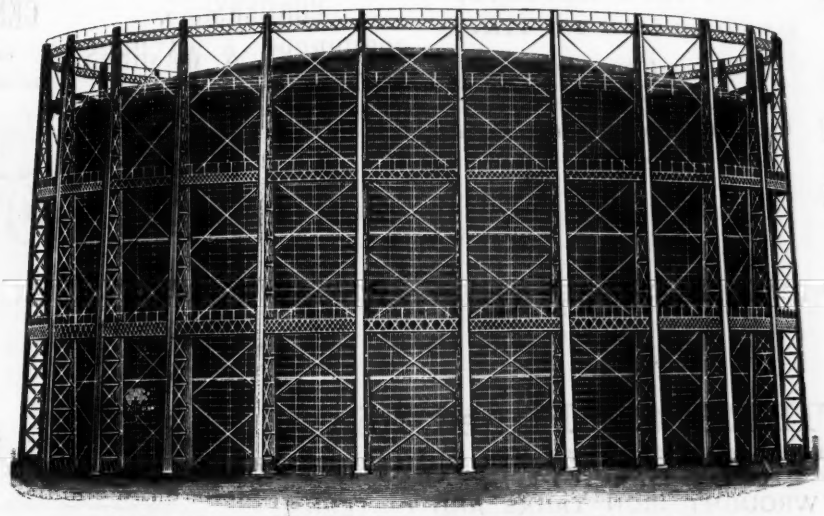

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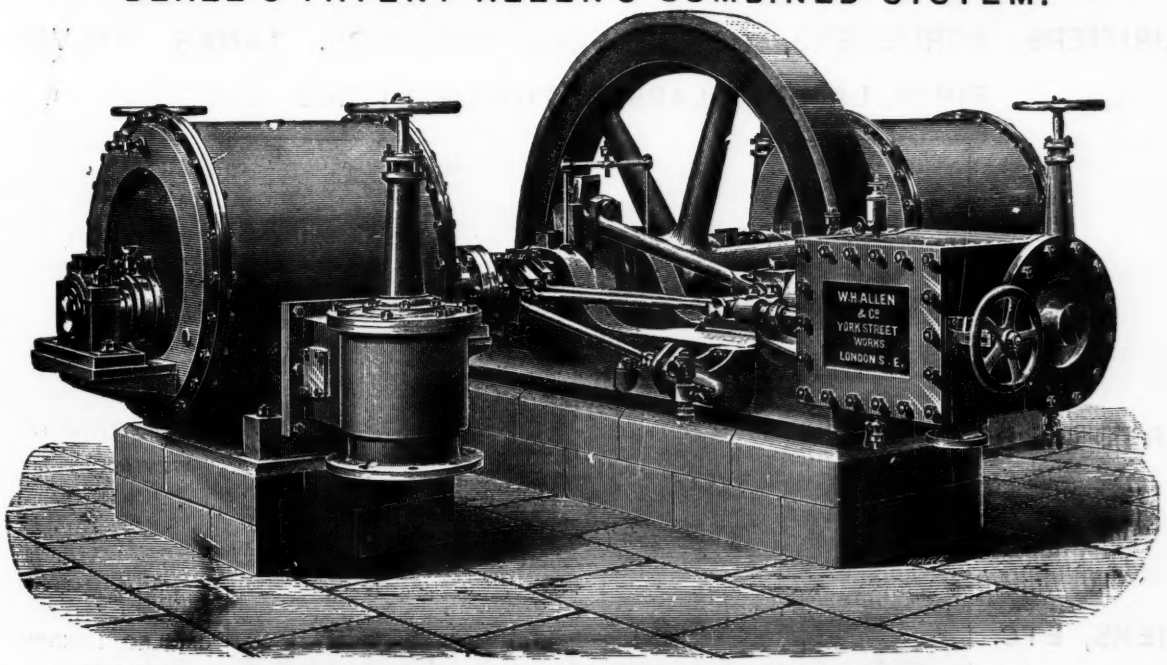

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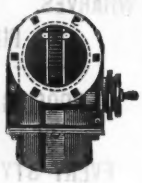

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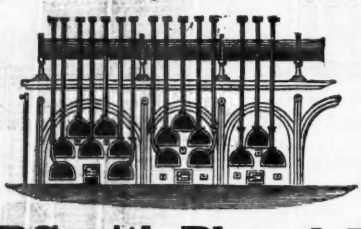

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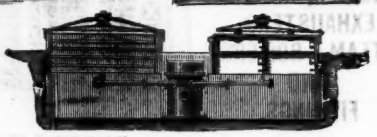

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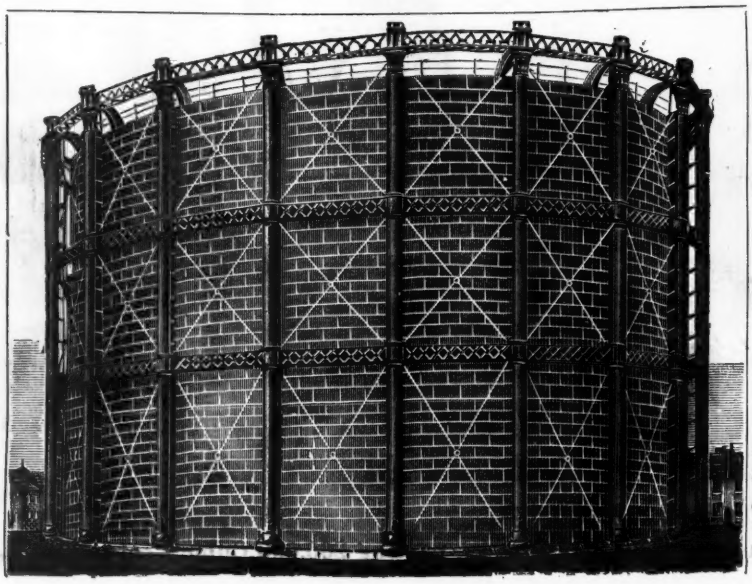

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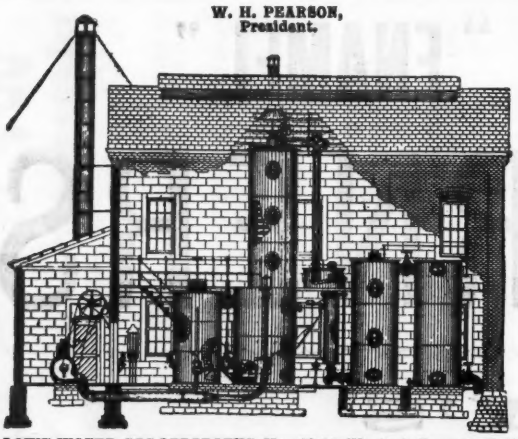

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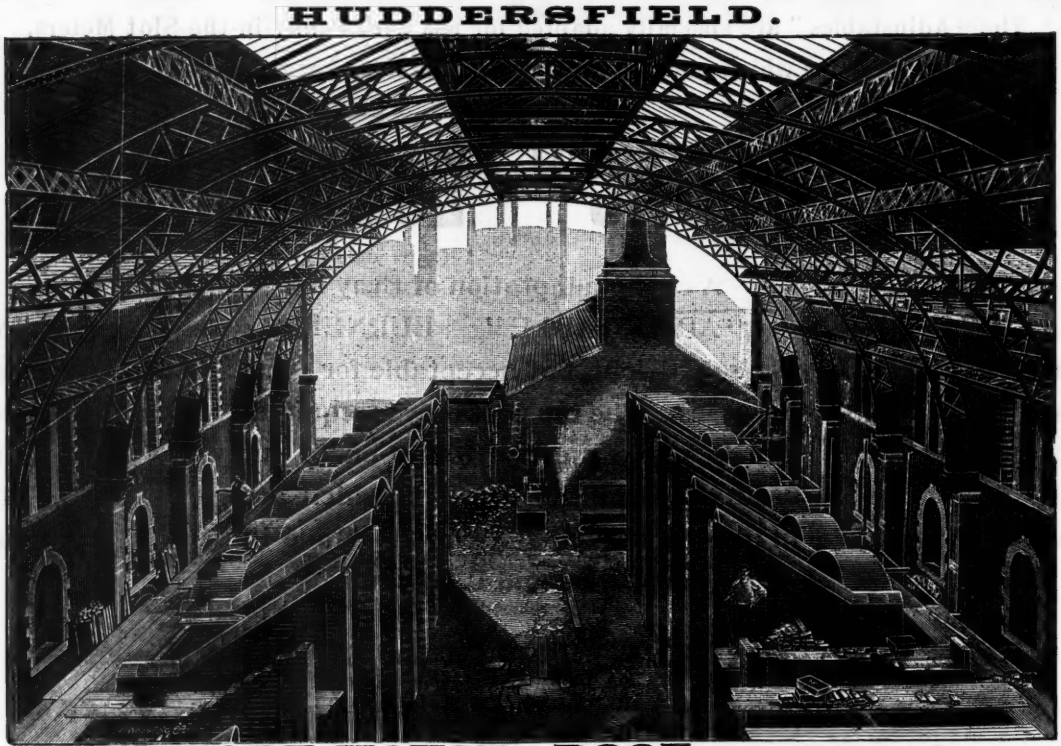

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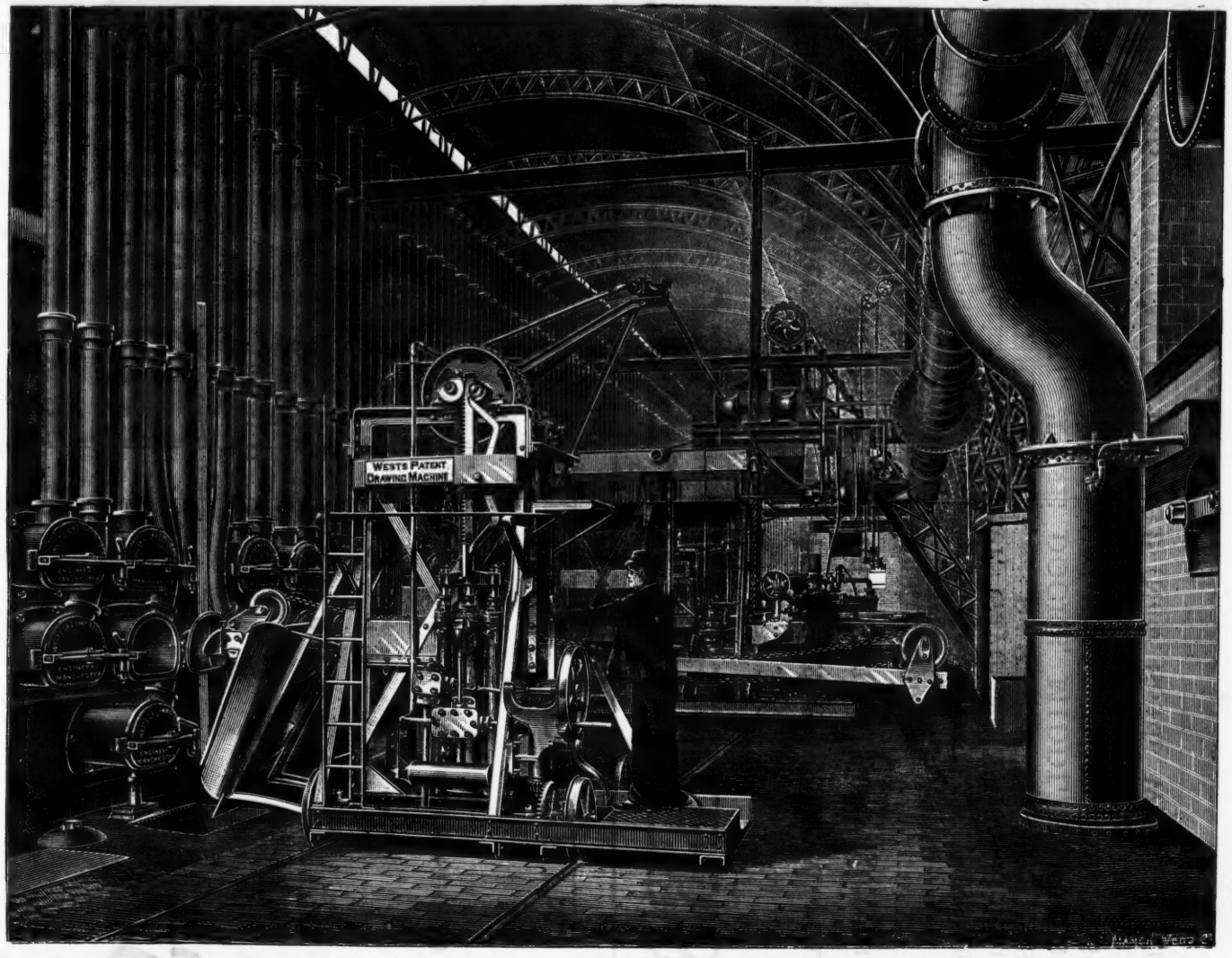

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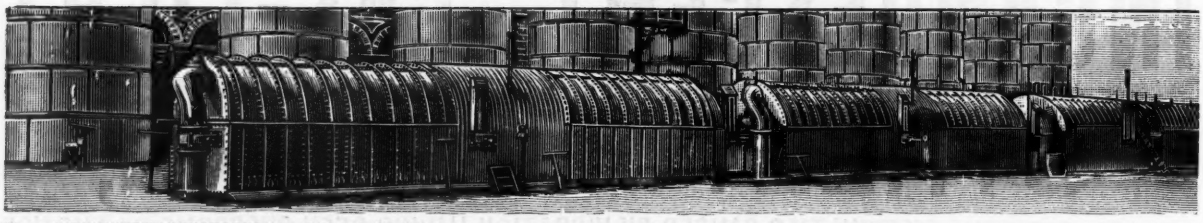

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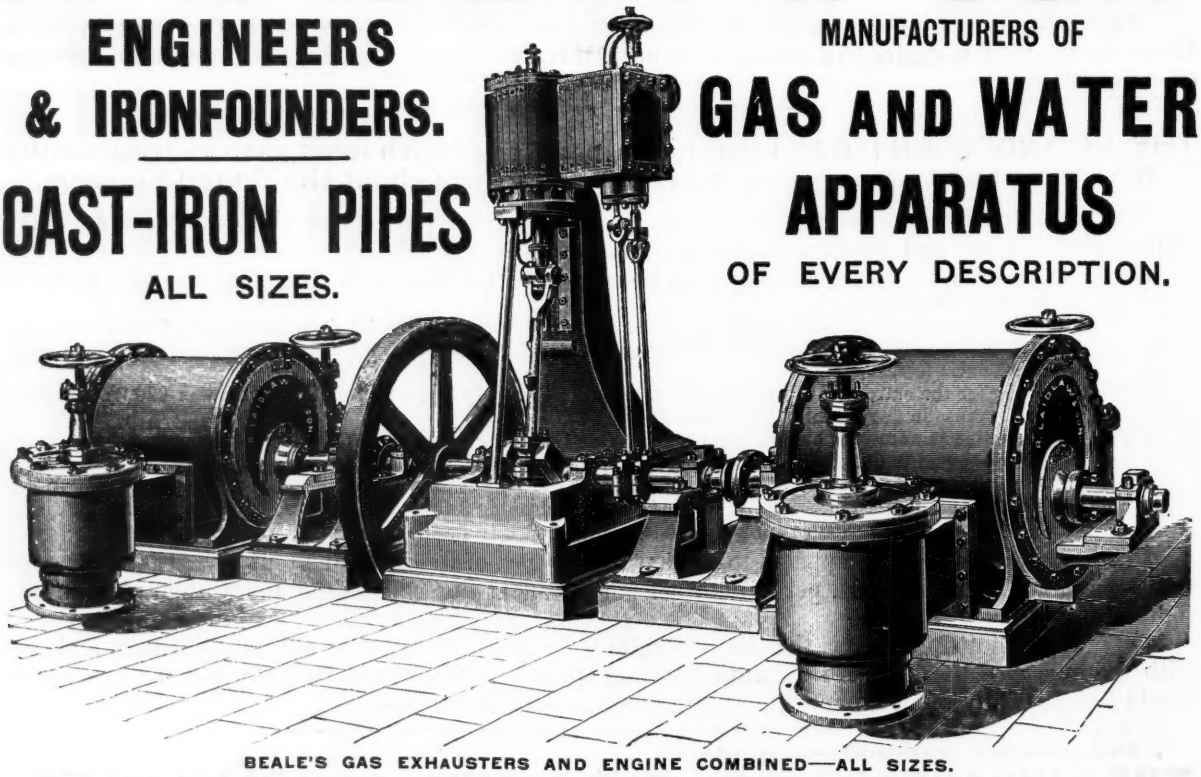

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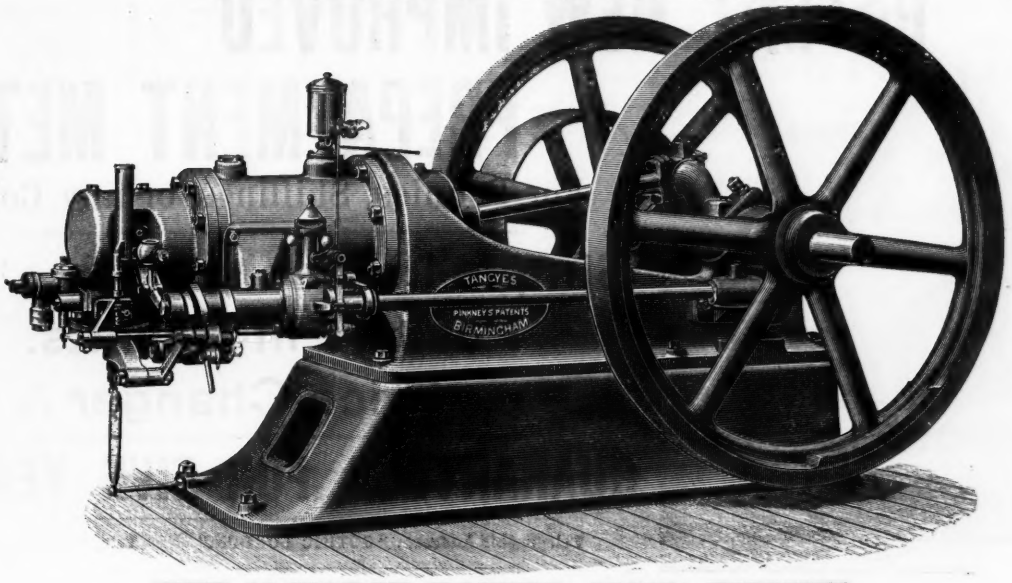

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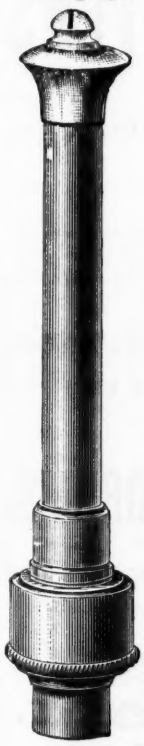

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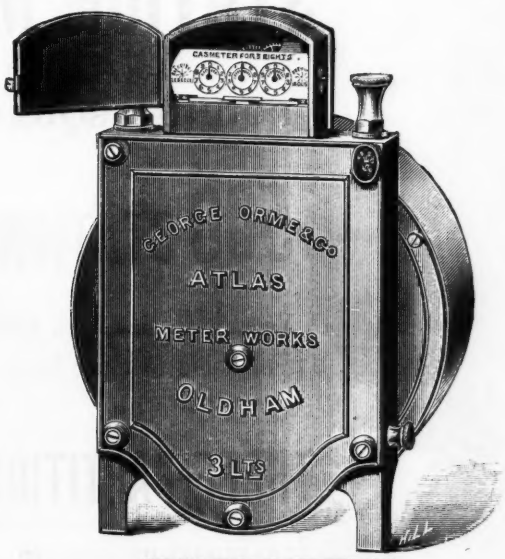

WET GAS-METER IN CAST-IRON CASE.

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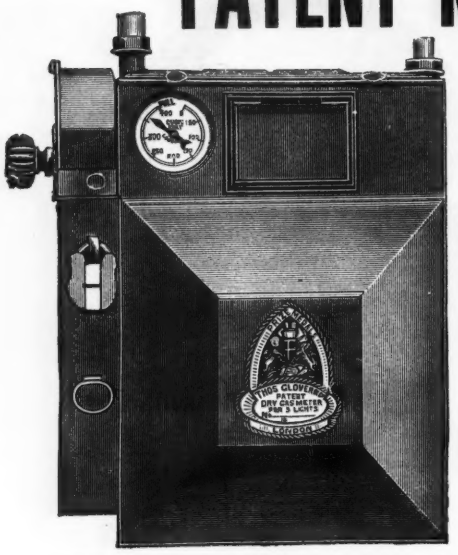

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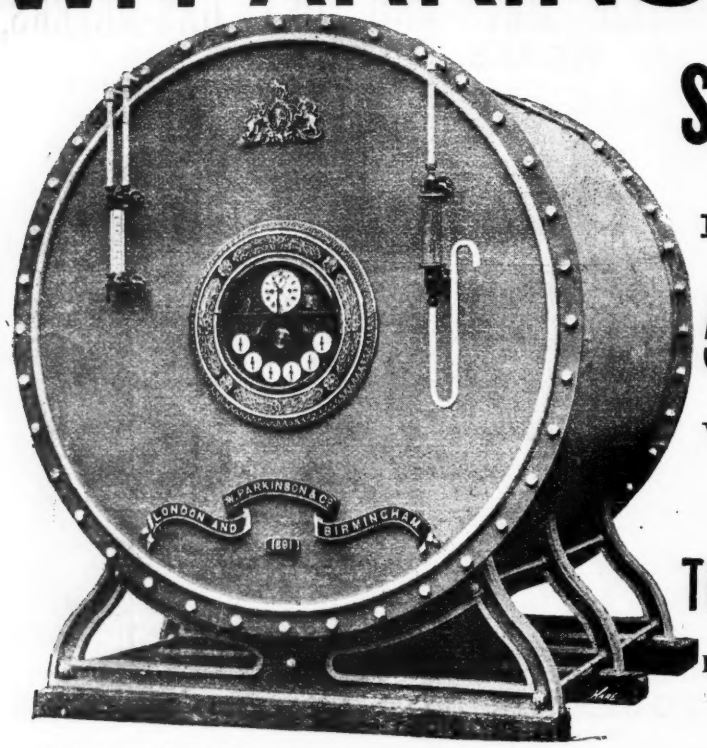

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TO CORRESPONDENTS.

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EDITORIAL NOTES.

Gas Engineers in Liverpool.

THE meeting of the Incorporated Institution of Gas Engineers in Liverpool last week was an unqualified success, and will ever be a pleasant memory for all who were able to attend, if only for a portion of the time. The fact of several members of the Institution being compelled by the exigencies of business to restrict their stay in Liverpool to a few hours, is an indication of the difficulty which must attend the gathering together of gas engineers and managers from all parts of the kingdom at this season of the year; while the equally salient complementary fact of their being willing to go to Liverpool, even for so short a time, may be taken as an indication of the strength of their loyalty to the Institution, and their earnest desire to do honour to Mr. William King, the host for the occasion. The programme for the meeting has been published in the JOURNAL; and it is sufficient now to say that it was carried out to the letter and the minute, under climatic conditions which were only too kind. It was an excursion and sociable meeting, pure and simple; in this respect repeating the character of the Leicester fixture of last autumn—due allowance being made for the "local "colour." It is not to be expected or desired that these social gatherings of the members of the Institution will ever become big and unwieldy crowds. Much—perhaps most—of the credit for the perfection and satisfying disposition of the arrangements for last week's meeting must be given to Mr. King, the President-Elect, who had been as energetic in planning out the time, as he was untiring in seeing that everything was carried through according to the programme. For two whole days the busy Engineer to the Liverpool United Gaslight Company placed himself absolutely at the disposal of his visitors—answering every question addressed to him respecting local matters with a degree of patience that sometimes rose almost to the marvellous; and the thoroughness with which, having invited the Institution to Liverpool, he went about to testify to the reality of the welcome prepared for all who accepted the invitation, was beyond praise.

We desire also to record the noble hospitality displayed on this occasion by the Directors, which was in all respects worthy of the best traditions of the Company and the City—it would be superfluous to say more about it. The Chairman (Mr. Edward Lawrence, J.P.) previously known only by name to the majority of the members through our reports of his official utterances to the proprietors of the Company, will henceforward be remembered by his guests as an impressive personality. It is surely unique for a gas company at home or abroad to have a single name identified with the management for a period of seventy-one years, as in this example of the Liverpool undertaking and the name of King. The gas engineers who knew the late Mr. Alfred King personally are now among the seniors of the profession; and one can only trust their memory and judgment when with one accord they testify to the manner of man that he was. The youngest and most progressive gas manager in the country, however, can see for himself that Liverpool still exhibits as advanced a school of gas engineering, under the direction of Mr. W. King, as the whole United Kingdom contains; and the doings in and about the city on the Mersey last week in connection with the meeting of the Institution, suggest the fervent hope that the tradition which bears such fruit may long flourish in its native soil. Altogether, the experiences of the Institution in Liverpool amply bear out the promise we gave in this regard on the 27th of August—which is, of course, highly gratifying all round.

Gas-Testing Extraordinary.

THE graceful and genial manner in which the administrative and managerial authorities of the Liverpool United Gaslight Company "unbent" during last week to their gas engineering visitors could not hide the fact that a good deal of annoyance—perhaps we had better term it disappointment—exists on the side of the Company with regard to the hostile, carping spirit in which everything that can be said or done by or on behalf of the undertaking is met by the "popular" party in the Liverpool Corporation. The Gas Company carry on their operations under certain statutory regulations which they are careful to obey in the smallest particular. Their works and methods, technical and commercial, are as perfect as skill and care for their

own interests as well as for the public service can make them; and yet the Corporation contains a party which is always "throwing stones" at the Company, and would sooner the city suffered anything, even to being plunged in darkness, than that the Company should prosper. Of course, these absurd individuals, whose sole conception of municipal duty it is to be "agin the Gas Company," cannot hinder the undertaking from going on increasing in the scope and variety of its operations. But they can, and do, make a great deal of fuss locally; and occasionally they succeed in becoming offensive beyond the limits of the city they adorn—which must be a source of immense satisfaction to them. Very recently we had occasion to comment upon certain proceedings in the Edinburgh Town Council, when a local magnate declared that the gas supplied by the Edinburgh and Leith Gas Commissioners had been found by a peripatetic testing party from Liverpool not to be all that his colleagues' fancy painted it. We have since been supplied with what purports to be an account of the doings of the wandering gas testers referred to on this occasion. It is in the form of a "Memorandum" of the Special Lighting Committee of the Corporation of Liverpool, signed by the Chairman, Mr. Frederick Smith, dated the 23rd ult., and giving particulars of tests of gas made in different towns by Mr. C. R. Bellamy, the Corporation Gas Examiner, under conditions which are duly detailed. What is not explicitly mentioned, however, but only allowed to peep out between the lines of Mr. Smith's not very logical observations upon Mr. Bellamy's results, is the object of all this performance, which is nothing more nor less than to convict the Liverpool Gas Company of paying too much for their coal, getting too little for their residuals, and charging too highly for their gas. We have searched through Mr. Bellamy's tables in vain for any test of Edinburgh gas, and can therefore only conclude either that his visit to Edinburgh is mythical, or that his test of Edinburgh gas has been deleted for some reason best known to the Committee who employed and accompanied him throughout his travels. This is curious.

With regard to the primary object of the Committee's researches—the finding of contemporary evidence capable of being used against the Gas Company—this appears to have been rendered difficult of attainment by the circumstance of there being hardly another town in England supplied with gas of about the same quality as that of Liverpool. True, they found something like it in Glasgow; but there are reasons why Glasgow does not compare equitably with Liverpool in regard to its gas supply, besides the one kindly and sensibly hinted at by Mr. Smith—that the Liverpool Gas Directors could get their coal as cheaply as the Glasgow Corporation can, if they were not so bent upon throwing away £150,000 a year, for the fun of the thing. There is Sheffield, to be sure; but it is only by virtue of a strange accident that Sheffield can be put alongside Liverpool. The Sheffield Gas Company pretend only to supply gas of an average candle power of 17·92; and seeing that their standard is put at 16·5 candles, this seems sufficiently liberal. The Liverpool test, however, ascribes to the gas of Sheffield an illuminating power of 20·40 candles, which, of course, makes this abnormally cheap commodity do still more credit to the Company than their modesty has permitted them to claim. The statement, as a whole, is distinctly entertaining and instructive, but not always in the sense intended by the compilers.

The Commercial Company's Report and Accounts.

THE report of the Directors and the accounts relating to the last half-year's working of the Commercial Gas Company have been published, and will be found reproduced in another column; the general meeting being called for Thursday. The revenue account shows a net profit for the half year of £48,680, as compared with £54,538 for the corresponding period of last year. With the amount carried forward and the usual deduction—to which is added a fresh entry of £637 for income-tax—there remains standing to the credit of the net revenue account a balance of £68,585 available for dividend. The Directors recommend the declaration of dividends after the rates of 13½ per cent. per annum upon the old stock, and 10½ per cent. per annum upon the new stock—being the same as last time; and also that the difference between these and the authorized rates of 13¾ and 10¾ per cent., having regard to the price charged for gas, be carried to the reserve fund. There are no other announcements in the report. The revenue account shows the gas-rental, at 2s. 6d. per 1000 cubic feet, to have amounted to £133,633, as against £128,836 for the corresponding period of last year, when the price was 1d. per 1000 cubic feet higher. The statement of meter-rental shows that the use of prepayment meters is still increasing in the district. The returns from residuals are not so good. Coke has fallen from £31,056 to £27,405, and ammonia from £12,559 to £7215. Tar only has improved, from £7262 to £8661. It would be interesting to learn what the Commercial authorities really and truly think of the condition to which the sulphate market has been brought. A drop in value of this commodity of 50 per cent. during the year means something to them, as it does to all producers. Thanks to the increased gas-rental, however, the gross revenue of the Company has only suffered to the extent of £2600. Coals cost £68,923, as against £62,087; and carbonizing wages are higher. There have been economies, on the other hand, in the matters of repair and maintenance. Bad debts are about the same; while law charges are a little more. The weight of coal carbonized rose from 100,435 tons to 108,381 tons, besides 1111 tons of cannel. The quantity of carburetting spirit used also rose from 110,385 to 201,864 gallons. The quantity of gas sold exhibits the substantial increase of 7 per cent., which is the largest rate of growth in the recent history of the undertaking. The balance-sheet shows a somewhat large addition to the stocks of residuals, which is not a satisfactory feature, if, as may be supposed, it indicates that these commodities were not readily saleable during the past half year even at the reduced values.

Carburetted Water Gas Interchangeable with Coal Gas.

THE two separate and independent accounts given in the present issue of the JOURNAL as to the working of carburetted water-gas plant, in Blackburn and Liverpool respectively, will be perused with different motives by a variety of our regular readers. It is not for us, of course, to perform the invidious and thankless task of comparing these examples with one another, with a view to ascribing technical or commercial superiority to either. All we are solicitous of doing in the interests of the British gas industry is to testify to the fact that the new method in gas manufacture has now established itself and earned satisfactory credentials in more than one pattern; and there can be no doubt that in this, as in other branches of trade, free competition will be beneficial both to makers and users. The Blackburn example is applied to an object now tolerably familiar to British gas managers from experiments that have been successfully instituted in London, Glasgow, Belfast, and Tottenham—it is for the time being an agency for carburetting the ordinary local make of coal gas. Blackburn has hitherto been supplied with gas averaging about 18½-candle power, produced by the carbonization of a mixture of common coal and cannel. Henceforward there is every probability of the use of cannel for this purpose being discontinued at the Corporation works, because the water gas, carburetted to an illuminating power of 21 candles or thereabouts, will be available as a cheap and convenient substitute for it. In Liverpool, on the contrary, 21-candle gas has to be sent out from the works to satisfy the statutory requirements of a supply testing to 20 candles anywhere in the district. Consequently, water gas of this quality has no carburetting value. It was therefore open to the Engineer of the Liverpool Gas Company, Mr. King, to follow the example of Glasgow, where it is understood that a highly carburetted water gas, of 40-candle power or so, is prepared for admixture with a much greater bulk of comparatively poor coal gas, in order to make up to 20 candles the quality of the gas sent out into the district; or to make his carburetted water gas of such a grade as to be capable of being distributed indifferently with his coal, or rather cannel, gas. As we think wisely—having regard to the local necessities of distribution—he chose the latter alternative; and, as a consequence, Garston to-day presents the unique example of a British gas-works sending out carburetted water gas for consumption as made, not for carburetting. The importance of this experiment, which appears so far to be an unqualified success, can hardly be overrated. What Liverpool is doing to-day, the rest of England may be disposed to do to-morrow, if

only it can be established that carburetted water gas can be prepared for consumption interchangeably with 16 or 17 candle gas, to as good advantage as it can be placed alongside 20-candle gas. Many things conspire to favour this development, if the economical conditions can be satisfied with oil at the present price. There will be no need for the new process to make gas much cheaper than an equal grade of coal gas, to render gas managers partial to it—at least as a means of providing for the "freak of "the load" in the depth of winter, and for the normal increase. It will not, so used, displace labour in established gas-works, but will rather provide employment for a lighter kind of labour than that which goes to common stoking. It will absorb the surplus coke—which is a great consideration for rapidly-growing works, where the coke sales do not advance *pari passu* with the demand for gas. And it will tend to keep a salutary check upon the cannel merchants, who have hitherto held gas managers to ransom in times of trouble in the coal market. Hence we await with interest any proof that carburetted water gas can be put alongside common coal gas, or coal gas slightly carburetted, as we now know it can be employed upon equal terms with cannel gas.

A Blue-Book on Work and Wages.

It cannot be fairly charged against the officials of the Board of Trade that they stint the public of solid fare in the shape of Blue-books. Hardly a week passes without the appearance of a new volume of reports or statistics dealing with the multitudinous subjects looked after by one or other branch of this busy Department—the latest being a report by Sir Robert Giffen upon the comparative statistics of the wages paid to the manual labour classes of the United Kingdom. This is in continuation of the reports and tables already issued relating to wages in the principal textile trades and in public and municipal employments. The information given is based upon schedules filled up by employers; and, with the experience previously gained, care has been taken to make the results trustworthy, and the averages for each trade true. One of the most important of the cases in which special arrangements were made to obtain reliable returns is that of the railway companies. In the case of seamen, the information wanted for the return was obtained from the articles filed at the office of the Registrar-General of Shipping. It is claimed that the Department has now in its possession much information as to rates of wages, changes in those rates, piece-work and logs, and other matters, and, according to the arrangements made, will have much more of such information in the immediate future; and it is desirable that this should be fully understood. Wages paid in gas-works are tabulated in this return. The conclusion drawn from these statistics is that since 1886 wages have generally tended upwards. The summary shows that, as regards men, the proportion earning less than 20s. per week is 24 per cent. only; between 20s. and 30s., it is 57·8 per cent.; and above 30s., it is about 18 per cent. Of course, these proportions would only apply to that part of the industrial community fairly represented by the trades dealt with in the tables comprised in the summary; but the list of occupations itself shows that the tables are samples of the great mass of occupations. It cannot be otherwise than advantageous to know where to find facts of this kind for use when questions of work and wages are being discussed.

Death of Mr. Arthur Willey.—It is with much regret that we record the death, at the early age of 33, of Mr. Arthur Willey, of Messrs. Willey and Co., Exeter. Deceased had been in delicate health for a considerable time; and for several years he had annually spent some months in Switzerland. Latterly, however, he seemed to be better; and it was hoped that a good span of life remained for him. Unfortunately, this hope has not been realized; and he died from consumption last Thursday. He leaves a widow and two children, for whom, as well as for the other relatives, much sympathy is felt.

Death of Mr. C. Overton, of Croydon.—Our readers may remember that, in the course of the very interesting account given by Mr. W. Hyslop, at the last meeting of the Croydon Gas Company, of the origin and development of the undertaking, he stated that, shortly after the works were established by a Mr. Defries, they were purchased by Mr. H. Overton, a wealthy brewer in the town, from whom they were acquired by the founders of the present Company. The son of this gentleman—Mr. Charles Overton—resided in a house in North End, Croydon, where he died rather suddenly last Thursday, at the age of 75.

WATER AND SANITARY AFFAIRS.

To-day has been appointed for the commencement of the inquiry directed by the Local Government Board in respect to the recent deficiency of the water supply in the district of the East London Company. As previously announced in our columns, the inquiry is to be conducted by Colonel Ducat, R.E., and Dr. F. W. Barry, both holding office as Inspectors under the Board. The Town Hall, Hackney, has been placed at their disposal; and great preparations have been made, in order to impress the Government officials with the extent of the default into which they are called upon to inquire. A deputation from the East-end Vestries has waited upon the Water Committee of the London County Council, to ask the assistance of the Committee in regard to these proceedings; and the question is to be dealt with in a report to be presented by the Committee at the meeting of the Council this afternoon. Somewhat in anticipation of this report, Dr. Collins, the Chairman of the Committee, told the deputation that "no doubt the Council would "be represented in some form at the forthcoming "inquiry." For no very ostensible reason, the Court of Common Council decided on Thursday that the Corporation should also be represented. Assuredly the City is not an East-end parish, nor the Corporation of London an East London Vestry. The County Council have an excuse for appearing, seeing that their jurisdiction extends over the whole Metropolitan area. Moroever, it has been rightly said that the Council are as much on their trial as the East London Company. But we can imagine that the Corporation do not like to see the County Council dominating the field, as a great central authority. One element in the agitation—and from it sprang the deputation to the County Council—has consisted in a conference of Vestry delegates, held in the usual head-quarters at the Hackney Town Hall. At this meeting it appeared that the Hackney Vestry had taken the somewhat unusual course—we might almost call it irregular—of sending a Sub-Committee to wait upon Colonel Ducat, previous to the public opening of the inquiry. The consultation which took place seems to have been limited to some unnecessary questions as to the extent to which Colonel Ducat would be prepared to receive evidence. The Colonel delighted the deputation by promising to take the necessary steps to secure the attendance of any witnesses who might be unwilling to come forward, as also to ensure the production of all books and documents likely to be wanted. We might ask whether this superfluous declaration was elicited by some suggestion from the Vestrymen that the East London Company would endeavour to evade part of the investigation. We venture to say that the Company will be perfectly willing to afford the most complete information, both verbal and documentary, and will cheerfully render the fullest assistance to the Inspectors. But the Directors have not called upon Colonel Ducat to say so. During the meeting of the delegates, Mr. Bousfield, Q.C., said he had offered to assist the Vestries in respect to the inquiry; but he explained that it was never his intention to conduct the entire case. His own view of the matter was that a joint Control Board or "Water Trust" for London and the surrounding districts was "absolutely necessary;" and when the matter came before Parliament, he would do all in his power to secure the appointment of such a Board. Mr. Bousfield may be sure that his view of the case differs from that which actuates the County Council.

The extent to which the conduct of the County Council is likely to come under review by the Government Inspectors in the present inquiry is a point of especial interest, which perhaps has been rather lost sight of by the Vestries, though we can hardly suppose that the Council are dull of apprehension in regard to the matter. In fact, it is this particular feature in the case which gives the Council a species of right as well as of obligation to appear before the Inspectors. If the conduct of the Council is not brought under review, the real cause of the recent deficiency in the supply must yet be shown as consisting in a want of reservoir capacity. The subject is very ably dealt with in a letter by "A Water-Works Director" which appeared in *The Times* last week. To this, a curious reply has appeared from the restless pen of Mr. Henry L. Cripps, who, as usual, leaves off with something more to say. In fact, his letter is singularly hazy as well as inconclusive. The "Water-"Works Director," on the contrary, writes in the most

unmistakable terms. Concerning the Bill of 1893, he quotes from a statement made by the County Council when the Bill was awaiting its second reading; the words being: "It was suggested on behalf of the Company that, unless "this Bill is passed, they will be unable to supply suf- "ficient water." This is the issue which Mr. Cripps has done his best to obscure, and which the County Council would evidently like the public to forget. The report of the Royal Commission is itself a thorough explanation of the recent difficulty; and we may say that, on the whole, there is something ludicrous in conducting a microscopic inquiry into a matter which is so palpable that its meaning can only be missed by those who have no desire to see it. But an inquiry has been asked for; and Mr. Chaplin has doubtless perceived that if he refused to grant it, the conduct of his department would be impugned. The utter hostility of the County Council to the Water Companies is shown by a recommendation from the Joint Committee on Public Control and Water Supply which comes before the Council to-day, repeating the proposal that the Solicitor should be instructed to take proceedings against the East London Company, for failing to maintain a constant supply—a failure simply due to the action of the Council. To show how zealous they are in the matter of the water supply, the Council are going to parade before the eyes of the public their famous Welsh scheme, an account of which appeared in some of the morning papers yesterday as "From a Correspondent." Who he is, matters little; but we described the scheme two months ago.

The decision in the Cardiff water supply case, reported in last week's JOURNAL, appears to be open to criticism. It turned on section 4 of the Water-Works (Regulation of Powers) Act, 1887—an extremely vague and unsatisfactory measure, which was added to the Statute Book at the instance of Sir Forrest Fulton. A person named Haines let to his tenant Newman a house at an inclusive rent; it being agreed that the landlord should pay all rates and taxes. For some years the landlord did pay the rates, including water-rates; but when he became bankrupt, the money was no longer forthcoming, and the Cardiff Corporation cut off the water supply. The tenant complained that this was a contravention of the Act; and the Deputy Stipendiary at Cardiff, holding that the complaint was well founded, fined the Corporation 10s. and costs. It was clear, however, that primarily the landlord was not liable for the water-rate. It was equally certain that he had not (in accordance with the practice where the owner is to be held liable for the money) entered into a written agreement to pay it. Nor was there even a scrap of evidence of an express verbal agreement on the landlord's part. This being so, the Magistrate's decision seems to have proceeded solely on the ground that demands had previously been made on the landlord and discharged by him, and that this constituted an implied agreement to continue paying. But it seems extremely doubtful whether evidence of so vague a character ought to be legally accepted as sufficient, where proceedings are taken under a highly penal enactment.

Excluding the admitted bargain between landlord and tenant, which in itself could not be binding on the Corporation, the groundwork left for the decision was of a singularly shadowy character. It raises, nevertheless, a widely important question as to the effect of bankruptcy upon a contract within the purview of section 4 of the Forrest Fulton Act. Bankruptcy relieves the property-owner from the obligations of any contract that he has entered into. But is his contract still to be binding, so as to give rise to penal consequences, upon the corporation or company from whom a supply of water has been obtained? Of course, a proof for the amount due in respect of water-rates can be lodged with the Official Receiver or Trustee in Bankruptcy; but in too many cases such a claim for dividend is not worth the bankruptcy stamp that must be affixed to the proof *plus* the eighteenpence that must be paid on swearing the debt. Of course, again, there is left the remedy which the Act gives by was of charge on the property of the contracting party. But for all practical purposes, the charge is worthless, because to enforce it would often cost a thousand times as much as the amount of the unsatisfied debt. In this respect, Water Companies have long found the Forrest Fulton Act a delusion and a snare; and the ruling in the Cardiff case would seem to show that the Act is even more one-sided in its operation than it had already been proved to be.

ESSAYS, COMMENTARIES, AND REVIEWS.

GAS AND WATER COMPANIES IN THE STOCK MARKET.

(For Stock and Share List, see p. 691.)

THE chief business in the Stock Exchange last week was the settlement, which was quite as heavy as ever, although we are supposed to be in the slack season; and this tended to keep new business down to low proportions. But, in spite of this, prices in every market rose steadily, instead of drooping for lack of support. There is so much money about just now, and dealings are on such an enormous scale, that stocks of all sorts, from the giltest-edged down to the decidedly risky, get forced up irresistibly. There was a strong demand for money for the settlement; but the supply was too great for that operation to have any real effect on the Money Market. Business in the Gas Market was about as active as in the preceding week; and the general tone was very similar. Dealings in Gaslight "A" were numerous. At the opening, the stock looked as if it would recover, and was done at 297½. But the promise of improvement was not realized; and the price weakened, so that, by the close, the quotation was a point and a half down. However, the secured issues of the same Company were in great demand; and the quotations of all the preferences had a considerable advance. Seeing that, at these figures, they still return a clear 3½ per cent. for money, it is a question whether they are high enough even now. Dealings in South Metropolitans were few and featureless, without any indication of a move either way. Hardly anything was done in Commercials; but, when the report and accounts for the half year came out on Friday, and showed a maintained 13½ per cent. dividend, and another ½ per cent. to the reserve fund, the old stock at once went up. Business in the Suburban and Provincial division was very scarce. Everything dealt in realized excellent prices; and Alliance and Dublin improved upon its quotation. Among the Continental Companies, there was little done, except in Imperial, which was active enough. Prices were steady at about middle values. The remoter undertakings were firm in general; while Monte Video and Chicago first mortgage bonds improved. Business in Water was very quiet. But prices showed no symptom of drooping; and Chelsea and Lambeth had a small advance. The issue of £100,000 of 3 per cent. debenture stock of the West Middlesex Company was subscribed five times over, and was allotted at an average of a little under 106 per £100 stock.

The daily operations were: On Monday, business in Gas stocks was active; and prices in general were firm without variation. Monte Video rose ½. Transactions were more restricted on Tuesday. Gaslight "A" showed renewed weakness; and the buying price was lowered a point. On Wednesday, business in Gas exhibited no inclination towards better activity. Gaslight "A" was steady. The secured issues advanced freely—"F" improved 5; "G," "J," and "K," 3 each; "C," "D," and "E," 2; and "H," 1. Chicago 2nd Bonds rose 3½. On Thursday, little else but Gaslight "A" was dealt in; and all prices remained unchanged. In Water, Chelsea gained 2; and Lambeth, 1. Friday's business in Gas was very limited; and prices were only moderate. Gaslight "A" fell back 1; but Commercial old rose 5. Saturday's operations were better; but prices closed unchanged.

ELECTRIC LIGHTING MEMORANDA.

The Affairs of the Brush Electrical Engineering Company—The City of London Electric Lighting Contract—The Brush Company and Electric Traction.

CONSIDERABLE interest attaches to the proceedings at the recent general meeting of the Brush Electrical Engineering Company, in view of the discouraging statement in the Directors' report touching the experience of the Company in regard to their City of London contract referred to in this column last week. The Chairman (Mr. J. B. Braithwaite, jun.) had no very enviable task to perform in setting forth the general position of the Company, not merely in this regard, but also in connection with the increase of the bank overdraft from £35,000 to £78,000. This somewhat alarming evidence of lack of ready money to carry on the business was explained as being due to a rearrangement of the Company's indebtedness (the bankers having advanced money to pay other creditors); while the rest is attributed to an increase of the shares and debentures held in other concerns. This explanation only goes to show that the occupation of these big electric trading companies is still as much with finance as with engineering; so that it is only with reservation of the unknown quantity representing the former interest that their accounts can be held as revealing the current state of the industry with which they are identified. At any rate, an amount of £105,000 of new debenture stock, which is to be nominally, and it is hoped practically, redeemable, is needed to put the Company in comfortable circumstances as to working capital. Seeing that the share capital still stands at £450,000, with

£125,000 of debenture stock, and that the net earnings in the past twelve months were £7400 net—which was not sufficient to pay the full preference dividend—it must be conceded that things will have to look up very considerably during the current year, if the sanguine views of the Chairman as to the future of the Company are to be realized.

Last year, as already mentioned, the Brush fortunes were darkened by the unfortunate issue of their contract with the City of London Company, which turned what, according to the Chairman, would have proved the best year of the Company's existence into the worst. The Chairman was manifestly reluctant to weary the shareholders with the details of this troublesome business. But, at the call of the meeting, he was induced to lift a corner of the curtain shrouding the mystery; and the explanation, such as it was, proved to be of particular interest for engineers and contractors generally—not merely those engaged in the electric supply business. He stated that the Company's contract with the City of London undertaking was one of considerable magnitude, involving as it did a total sum of £300,000. Under the contract, the usual stipulation was made reserving to the Engineer of the Company contracted with the absolute decision as to whether or not the terms of the contract were being carried out. There is no reason to suppose that this provision would not have proved satisfactory to both parties, in ordinary circumstances. But, as it happened, the Lighting Company changed their Engineer three times while the contract was being carried out; and the last change turned out disastrously for the Contractors, for the third new Engineer entertained very different views from those held by his predecessors as to the way in which the obligations under the contract should be discharged. As this unaccommodating officer was sole and supreme judge of the matter, there was nothing for it but to "knuckle under;" and this, after enduring much tribulation, the Brush Directors eventually did, with the sad financial result already recorded. The high contracting parties being thus reconciled, by a compromise which appears to have been all one way, work was resumed. The simple tale told by Mr. Braithwaite gives rise to many reflections. As usual, nobody was held to be blameworthy for the Company's misfortune. The agreement to leave the Engineer of the givers of the contract sole arbiter of all questions arising during the execution of the work, is, indeed, not extraordinary. Nevertheless it is equally common to make provision for a reference of differences of opinion in this regard to an independent arbiter. In the present case, the contract appears to have been entered into at an era when the two Companies were in very intimate relationship, administrative and otherwise, with one another. These relations were altered in the course of time; and with the alteration there may well have arisen a question as to which party should be the more considered in regard to the obligations under the contract. The change of Engineers, to which the Brush Company's Chairman attributed this Company's affliction, may equally well have been an effect as a cause of the alteration of the City of London Company's attitude towards their former colleagues. There is a well-known narrative poem which tells in moving language how a grey beard undertook to instruct a youth in the science of chess-playing, with the not unnatural result that, in the fulness of time, "the old man was beaten by the boy." The Brush Electrical Engineering Company was once known familiarly as "Grandfather Brush;" and the City of London Company is the progeny of the old age of this not particularly reverend patriarch. There is something almost pathetic about the idea of this young creation of the Brush interest "doing" its parent to the tune of £19,000 in a single half year. But consider the bringing-up it had! Will this be the whole of the loss, we wonder? Nobody asked the question at the meeting; but time will show.

We have dealt at such length with the prospects and vicissitudes of the Brush Company this week, that it is hardly worth while to open up another electric subject. Let us conclude, therefore, with a notice of Mr. Braithwaite's observations upon the future of electric traction. It appears that the Company are paying great attention to this branch of the electric industry; and, in particular, are laying out their works for the manufacture of specialities in electric railway and tramcars and engines. The Chairman admits that it is to electric traction that the Company must look very largely in the future to keep the engineering shops full, which is as much as to say that there is not a great deal more to expect from electric lighting. He declared that "electric lighting is a firmly established industry, and is not likely to retrograde;" but he said nothing whatever about the prospect of there being many more £300,000 contracts to be picked up in this line—which, considering the Company's latest experience, is not, perhaps, regretted by the Directors. His expectation of imminent developments in the electric traction branch is perfectly understandable; and there is no apparent reason why the Brush Company should not secure a fair share of such work as may be going in this department. It will, however, be a fresh venture for them; and there are too many rivals in the field to enable the old plan of concessionary ventures to be tried again with any hope of success. It is but fair to the Brush Directors to record that, having regard to the position in which the Company have been placed by the unprecedented circumstances in connection with the City of London contract, they will forego half their fees for the ensuing year.

THE INSTITUTION OF GAS ENGINEERS IN LIVERPOOL.

It was generally believed that the Liverpool autumn fixture of the Incorporated Institution of Gas Engineers would prove popular; and the expectation was justified by the attendance of a numerous party of members on Thursday morning last at the Lime Street Station, when the opening event of the very promising programme—a visit to the Garston works of the Liverpool United Gaslight Company—was entered upon.

The train started at 9.50; and a few minutes took the party to the gas-works, which at present occupy an area of 7½ acres of a piece of land 31 acres in extent, acquired by the Company some years ago in view of the future needs of the undertaking in this neighbourhood. By the time when it became a practical question of utilizing the site for manufacturing gas, the feasibility of introducing carburetted water-gas into England had arisen as a problem of the hour; and Mr. W. King, the Company's Engineer, who was one of the first "on this side" to make a study of the subject, recommended his Directors to try the new system of gas making on the opportunity presented by the pending extension of the Company's manufacturing resources. The advice, fortified as it was by the results of a tour of inspection in the United States, was taken and acted upon; and the contract for the carburetted water-gas plant was given to Messrs. Humphreys and Glasgow, with eminently satisfactory results. In preparation for the new departure, however, Mr. King set to work to lay out a portion of the site in the far-seeing and thorough spirit which has long been a tradition of this great undertaking. A large storage gasholder and a relief holder were erected; and a fine example of construction the former is, although (perhaps some would say because) it does not exhibit any leanings towards the fashion of a modified guide-framing. The storage of a large quantity of oil was the next consideration; and this has been satisfied by the construction of two circular tanks, each of 1100 tons capacity. These are based upon a gridiron foundation, so as to be accessible underneath as well as all round for inspection. They are situated in a half-sunk and walled pit, so that, in the event of any oil escape and fire, no possible damage to anything else could ensue. Owing to their position, the tanks can be half-filled by gravity from railway tanks, run in on a siding from the adjoining railway; and there is a steam-pump connection to do the rest. Double valves, and every other precaution that experience and forethought can suggest, have been adopted to make the oil storage absolutely secure.

A plain, substantial brick building measuring about 155 feet by 55 feet, looking more like a mill than a retort-house—which latter type of structure, indeed, it does not in any way suggest—has been built to accommodate the generating plant, which it does with ample room and to spare. At present four sets of generators, with their superheaters and subsidiary appliances, are installed; constituting one-half of the intended equipment of the building. Only one set is actually needed for the present; and it is at work continuously. When filled up, the output of the house will be nominally 7 million cubic feet of carburetted water-gas per day; so that the present capacity is 3½ million cubic feet of gas per diem. The quality of gas manufactured is intended to be practically the same, as regards illuminating power, as the ordinary coal gas sent out by the Company—that is to say, 20-candle power (as measured by the aid of a flat-flame burner) in any part of the wide district. To ensure compliance with this standard, the works send out 21½-candle gas; and in order not to fail of giving satisfaction with the new kind of gas, this is made three-quarters of a candle better. For it will be observed that the use of carburetted water-gas by the Liverpool Company is not for enrichment, but as a product capable of being distributed and burnt interchangeably with the ordinary supply. This is the only undertaking in England which has up to the present acted in this way in regard to carburetted water-gas. The plan has been entirely successful both economically and technically. The Garston output stands the Liverpool Company in rather less than the cost of an equivalent make of cannel coal gas; and although the specific gravities of the two descriptions of gas differ, none but a few consumers, employing small and poor flat-flame burners, notices when the flames are supplied by the one or the other gas.

It is scarcely necessary now-a-days to describe at length the manufacture of carburetted water-gas, at Liverpool or anywhere else. Four-minute blows and seven-minute runs are the rule at Garston; and the whole apparatus works to admiration. The oil used is "Solar Distillate;" and the coke is sent in from one of the coal gas manufacturing stations. The gas is purified from carbonic acid and sulphuretted hydrogen; and the separated tar is burnt under the boilers. The whole station—buildings, gasholders, and manufacturing plant—should certainly be seen by the experienced gas engineer, who will not fail of being struck with a sense of the completeness, soundness, and general excellence of everything in and about the station.

At Garston, the party lunched; and thence drove in brakes to the Herculaneum Dock Station of the Liverpool Overhead Electric Railway. After a run in the cars, there was a stop to inspect the very complete power generating station of the Railway Company; and then an adjournment was made to the famous Landing Stage, where the process of bringing alongside the Cunarder *Cephalonia*, to sail the same afternoon for Boston,

was witnessed with interest. By the kindness of the Directors of the Cunard Line, a tender was provided which conveyed the party to the great liner *Lucania*, lying out in mid-stream; and the splendid ship was inspected from end to end, tea being served to the party in the saloon. The return to the city completed the business of the day; and the dinner given by the Directors of the Gas Company in the evening fittingly rounded off an outing which will be ever remembered with pleasure by all who participated in it.

The second day was devoted to a trip to Chester—the railway journey starting from Birkenhead; and after the many unique antiquities of the city had been inspected, a steamer took the party up the River Dee to Eaton Hall, the seat of the Duke of Westminster, the architectural beauties of which were duly appreciated. "And so," as Pepys would say, "back to Chester and home, well pleased with the entertainment and the company." No time was lost during the meeting in passing complimentary votes; but we take this opportunity of recording, on behalf of the members present at this gathering, the general sense entertained by them of the hospitality of the Directors of the Liverpool Gas Company, the kindness passing ordinary of Mr King, and the efficiency of everybody concerned with the arrangement and carrying out of the programme.

THE NEW WATER-GAS PLANT AT BLACKBURN.

THERE is now in daily operation at the Blackburn Corporation Gas-Works a very complete example—the first of its kind to be started in this country—of the carburetted water-gas plant put upon the market by the Economical Gas Apparatus Construction Company, of Toronto and London, who are working under the "Merrifield, Westcott, and Pearson" patents. The plant in question has a nominal producing capacity of 1¼ million cubic feet per 24 hours. It is in duplicate in all essential parts. One part only is, however, required for use at present, and this only for 12 hours a day, although complete 24-hour trials of the apparatus were made under the supervision of the Gas Engineer to the Corporation (Mr. S. R. Ogden) before the plant was taken over from the constructors. The contract was fully completed, we understand, a month prior to the stipulated time; and the guarantee given by the Contractors has been amply covered by the every-day performances of the plant—a "double event" upon which the Corporation and the Contractors are together to be congratulated. As the plant stands, it is in all respects a workmanlike and creditable piece of gas engineering, complete to the last particular, with nothing left to be adjusted or made good or to be in any way corrected. What this means in a new departure of this importance, engineers do not need to be reminded.

The water-gas plant has been installed in an old retort-house 44 feet square, cleared out for its reception, and provided with two annexes—one containing the steam-engines, pumps, and blowers, the other accommodating two boilers, either of which could supply steam for the double arrangement of generators and superheaters. The supplementary equipment comprises an underground storage tank for oil, which is filled by gravitation from the railway-tanks; an oil service-tank which commands the superheaters; and the relief gasholder. The carburetted water gas is made, scrubbed, condensed, and purified by lime (to remove the carbonic acid gas) before being mixed with the coal gas made upon the same works. The engine-room contains a pair of No. 8 Sturtevant fans, each driven by a belt from a vertical Tangye engine, a Waller's exhauster, and the oil-pumps. This is under the charge of one man. Another man attends upon the generators and gas-making part of the plant; and then there are the boiler and generator furnaces to be fed, and the latter clinkered. This accounts for the whole of the working staff of the new department.

The gas-making plant proper comprises a pair of generators, which are oval section, measuring 8 ft. 6 in. by 10 ft. by 14 ft. 6 in. high, closely connected with superheaters 8 ft. 6 in. in diameter by 32 ft. in height. The lower part of these vessels is styled the superheater, up to the level of the upper oil-feeds; the portion above this being called the fixing chamber. Water-cooled valves are provided, so arranged that the processes of blowing-up and gas-making can be effected either upwards or in the reverse direction; and the gas, when made, passes through a seal-cup, heats the oil supply, and is afterwards scrubbed and condensed. Water is used in the scrubbing process; and this and the residual tar are subsequently run off together into an underground separator—the first of its special kind to be tried in this country—where a perfect separation of the two fluids takes place, so that the water could be used over again if desired, while the tar is burned under the boiler to help the coke used for steam-raising.

At the present time, six-minute blows and six-minute runs are the working rule; the attendant going simply by the clock, and having all his valves conveniently at hand upon the stage which is erected over the tops of the generators. For every run, he uses 28 gallons of oil, measured by a Worthington oil-meter; and he feeds his generators when required with coke delivered to him in tipping-waggons sent up by a lift. These contain about 16 cwt. of coke. There being two charging-doors to each generator, each side is charged alternately, for the purpose of giving a better distribution of the fuel than a single central door. The furnace only requires clinkering once every twelve hours.

The oil at present used at Blackburn is Russian "Solar Distillate;" but, of course, any description of mineral oil, free from pitch, that could be more cheaply purchased would answer the same purpose. It is simply in this regard a matter of proportioning the consumption of oil to the run. The same observation applies to the management of the generator. At Blackburn several descriptions of coal are carbonized; and consequently the quality of the coke supplied to the water-gas plant is constantly changing. No trouble in working has, however, been experienced on this score; it being a simple matter to vary the duration of the blow and the run, and by a reversal of the current to ensure the distribution of heat in the generator and superheater to the best advantage.

There are many admirable points of well thought-out detail in this Blackburn plant; but these cannot be described at length here, even if we could hope to make them really clear by the aid of letterpress. An engineer's eye would, however, take them in at a glance; and we can confidently assert that it will be worth while for any engineer desirous of keeping abreast of the modern development of carburetted water-gas manufacture in this country to proceed to Blackburn and examine the new plant for himself. This is the more desirable as every detail of a plant of this character registers some valuable experience; and in water-gas making it is experience rather than the knowledge of first principles which is essential to success.

Now for the results. The carbonizing book was laid open for inspection; and from its pages we took the following data, applying to twelve-hours' working on the 16th ult. Actually, the apparatus was at work from 6.10 a.m. to 5.42 p.m., or (in all) 11 hours 32 minutes:—

Gas made	352,000 cubic feet.	
Oil consumed, 1072 gallons . .	= 3·04 gallons	per 1000 cubic feet.
Coke for generator, 11,088 lbs. .	= 31·50 lbs.	" "
Boiler fuel coke	6·00 lbs.	" "
Illuminating power of gas . .	20·65 candles.	
Illuminating power per gallon of oil	6·79 candles.	
Candle-feet per 1000 cubic feet .	1358	

This gas was made in 42 runs, averaging six minutes per run, in one generator set. The residual tar, as already stated, is burned under the boiler to help the coke. The illuminating power is taken by means of a bar photometer, from the purified gas. On Sept. 19, gas was made for six hours only, which is, of course, very unfavourable to the plant. On this occasion, 167,000 cubic feet of gas, of an average illuminating power of 23·04 candles, were made with an oil consumption of 3·42 gallons per 1000 cubic feet, and 33·2 lbs. of coke for the generator, besides 6·89 lbs. of coke per 1000 cubic feet for the boiler. In a 24-hour run, the consumption of coke for gas making would not exceed 28 lbs. per 1000 cubic feet of gas.

Official Changes at the Oldham Gas-Works.—Owing to ill-health, the Manager of the Higginshaw Gas-Works of the Oldham Corporation (Mr. Piper) has been absent from his duties for some time; and he is still unable to resume them. In consequence of this, Mr. Edwin Platt has been placed in authority at the station, under the supervision of the Gas Engineer (Mr. J. Chadwick); and Mr. Piper, if his health improves, will have other duties.

Mr. Richard Carter, Assoc.M.Inst.C.E., died last Thursday at Harrogate, in his 78th year. He had an extensive practice as a Consulting Engineer; among his engagements being those of Director and Consulting Engineer to the Harrogate Water Company and Engineer of the Ripon Corporation gravitation water scheme. He also carried on an extensive linen manufacturing business at Barnsley, of which town he was twice Mayor, as well as Chairman of the Water Committee.

Personal.—Mr. G. Keyte, of Ramsgate, has obtained the appointment advertised in the JOURNAL for Aug. 13 under No. 2553. Mr. F. W. Jones, formerly of Broseley, Salop, and son of Mr. J. H. Jones, of Ironbridge, Salop, has been appointed Manager of the Bingham, Notts., Gas Company, Limited—a position formerly filled by Mr. J. E. Hughes, who, as mentioned last week, has now gone to Holyhead. Owing to the extra duties imposed upon Mr. Matt. Dunn, Assoc.M.Inst.M.E., the Gas Engineer and Manager of the Selby Urban District Council, by the extended demand for gas, he has been granted an increase of £50 per annum in his salary, to date from July 1 last; and he is to have an assistant on the works.

Presentation to a Servant of the Glasgow Gas Trust.—Last Friday evening, in the Royal Restaurant, Glasgow, there was a large gathering of the local Gas Trust employees convened to make a presentation to Mr. Harry Smith, who is about to leave for the Transvaal. Mr. Hugh Scott, the Chief Clerk in the Engineer's department, occupied the chair; and, in making the presentation, referred to the fact that Mr. Smith had been upwards of a dozen years in the service of the Corporation Gas Commissioners, first in the stores department at the Dawsholm works, and for the past seven years in the Engineer's department. As tokens of the great regard entertained for him, Mr. Scott placed in his hands a splendid gold watch and a pocket barometer, with combined thermometer and compass. Mr. Smith made a suitable reply; and subsequently there were brief speeches by other members of the company. These were interspersed with songs, recitations, &c.

TECHNICAL RECORD.

GEOLOGICAL RESEARCH AND UNDISCOVERED STORES OF WATER AND COAL.

At the recent Meeting of the British Association, the President of the Geological Section (Mr. W. Whitaker, F.R.S.), devoted a large portion of his Inaugural Address, which was entitled "Underground in Suffolk and its Borders," to a consideration of the question of how far the sinking of wells has furnished information which will assist the geologist in the search for coal in South-Eastern England. His remarks on this subject were as follows:—

It is only from wells that we can tell the thickness of the drift over most of the great plateau; open sections being rare, except on the coast. The drift includes everything above the Chillesford clay—practically all the post-tertiary formations. No fewer than 173 sections show a thickness of 50 feet and upward; while of these, 34 prove 100 feet of drift, and some much more. At one place, the bottom of the drift has not been reached at a depth of 340 feet, or nearly 140 feet below sea-level. In the town of Ipswich, one boring has pierced 70 feet of drift, and another 127 feet in ground but little above the sea-level. The sandy deposit of the red crag rarely reaches a thickness of 40 feet. But, on the other hand, wells at Hoxne seem to prove more than 60 feet of crag; while at Saxmundham the formation is 100 feet thick; and at Leiston and Southwold, it is over 140 feet. At some depth underground, the colour-name is a misnomer—the shelly sands being light-coloured and not red. Below the crag, there is a great gap in the geologic series; and we come to some of the lower of the tertiary formations.

There are records of more than 40 wells in Suffolk that are partly in these deposits, and 36 of these reach down to the chalk—20 giving good sections from the London clay to the chalk. The important evidence given by these wells shows the underground extent of the older tertiary beds beneath the great sheet of crag and drift. Over this large tract, we can know nothing of the beds beneath the crag otherwise than from wells and borings; and until these were made, our older geologic maps cut off the older tertiary beds far south of the parts to which they are known to reach, though hidden from sight. Though the chalk is reached by many wells, less information can be obtained by reason of its great thickness; and the amount of overlying strata forms a bar to deep exploration. Of the Suffolk wells, 40 go through 100 feet or more of chalk. Of these, 20 go through 200 feet, 10 through 300 feet, and 5 of these through 400 feet or more. But in no case yet recorded has the chalk been pierced from top to bottom in Suffolk.

Reasoning, however, from the well-known Harwich boring, which passes through the whole of the chalk, proving a thickness of 890 feet, it may be concluded that in the south-eastern part of Suffolk the chalk reaches a thickness of about 900 feet. Towards the northern border of the county, it is probably more, as the deep boring at Norwich passes through nearly 1160 feet of chalk, and that without beginning at the top of the formation. The evidence tends to show that the upper chalk forms a good deal more than half, and perhaps about two-thirds, of the formation; the middle and lower chalk being rather thin. The glauconite marly bed at the base seems to be well developed, and to be underlain by the gault clay; so that there is no good evidence of the occurrence of upper greensand. The little that is known of the gault points to this formation being usually thin—presumably only 73 feet from top to bottom at Culford, and probably not more than between 50 feet to 60 feet at and near Harwich. The lower greensand has been found in one deep boring only, at Culford, in the north-west of the county, where it is represented by 32½ feet of somewhat exceptional beds.

When we reach the base of the gault, we pass from the region of facts into the realm of speculation, and come to perhaps the most interesting problem in the geology of the eastern counties—the consideration of the question: What rocks underlie the cretaceous beds at great depths? Beyond the outcrop of the lower beds of the chalk series in Cambridgeshire and Norfolk, there is a powerful development of the great Jurassic series. But the only two recorded deep borings in and near Suffolk that have pierced through the cretaceous base—at Culford and at Harwich—show not a trace of anything Jurassic; they pass suddenly from cretaceous into far older rocks. The recent trial boring at Stutton shows just the same thing, for the gault rests directly on a much older rock which cannot be classed as of secondary age. There are ten deep borings reaching to old rocks in the London basin, of which accounts have been published. In four of these (at Meux's, Streatham, Richmond, and Dover), Jurassic beds separate those rocks from the chalk beds; so that there are six in which these last rest directly on old rocks (at Ware, Cheshunt, Kentish Town, Crossness, Culford, and Harwich). Stutton makes a seventh. We owe nine of these borings to endeavours to get water from deep-seated rocks.

The borings at Dover and Stutton were started for a much more definite object than merely to prove the depth to older rocks, or the thickness of the cretaceous and Jurassic series. It has become the turn of geologists to help those who would find coal. The trial at Dover was successful; several hundred feet of coal measures having been found without reaching their base, but with several beds of workable coal. Fairly good reasons can be given both for and against the selection of many places for trial except in and near London, where no geologists would recommend it from evidence possessed. The area within which the borings that reach older rocks in the London basin is enclosed is an irregular pentagon formed by joining, in the order named, Dover, Richmond, Ware, Culford, Harwich, and Dover. The greatest distance between any borings is from Dover to Culford—about 86 miles. Therefore it is over a large tract that we have good reason to infer that older rocks are within reasonable distance of the surface, nowhere probably so much as 1600 feet, and mostly a good deal less. Outside this tract, several trial borings have been made. Near Burford, in Oxfordshire, carboniferous rocks, consisting of coal measures, have been found at a depth of 1180 feet, and pierced to a depth of 230 feet. In and near Northampton, carboniferous beds, older than the coal measures, have been found; and at Scarle, south-west of Lincoln, the older rocks have been reached at the depth of 1500 feet, beginning with the Permian—the carboniferous occurring after another 400 feet. These have been pierced for 130 feet.

Over a large part of South-Eastern England, reaching northward and westward of the London basin, though the older rocks are hidden by a thick mantle of Jurassic, cretaceous, and tertiary beds, they yet seem to be rarely at a depth that would be called very great by the coal miner. They are distinctly within workable depths wherever they have been reached. There is no area of old rocks at the surface in our island, south of the Forth, in which coal measures are not a constituent formation. It is not, however, to the more northern and distant tract—*i.e.*, north of the Forth—that we should look for analogy to our underground plain of old rocks; but rather to more southern parts, to Wales and to Central and Northern England, where coal measures are of frequent occurrence. There is no reason why we should not suspect a like occurrence of coal measures in detached basins, in our vast underground tract of old rocks. Certainly trials should be made to see if such hidden coal basins can be found.

The Dover boring has proved the presence of coal underground in Eastern Kent, along the line between the coal-fields of South Wales and Bristol on the west, and those of Northern France and Belgium on the east. The long gap between the distant outcrops of the coal measures near Bristol and Calais has been lessened very slightly by the working of coal under the Triassic and Jurassic beds near the former place, but much more by the French and Belgians, who have not only proved the extent of the coal measures beneath the Jurassic and cretaceous beds along their borders, but have largely worked the coal found. The Dover boring has still further lessened the gap. The Stutton boring cannot be said to be either a success or a failure as far as coal is concerned; but it is certainly a success in the matter of reaching the old rocks at a depth of less than 1000 feet.

Every boring is almost certain to afford some knowledge that may help in future work. A boring that may at first seem to be a failure, from striking beds older than the coal measures, may some day turn out otherwise. The coal-field along the borders of France and Belgium is sometimes affected by powerful and peculiar disturbances, by faults of comparatively gentle inclination (far removed from the usual more or less vertical displacements), which have thrown coal measures beneath older beds in large tracts. This was once a theory, but is no longer so, for much coal is now worked below the older beds that have pushed above the coal measures by the overthrust faults.

Another point to which attention has been drawn by Continental geologists is an apparent general persistence of disturbances along certain lines, or, in other words, the recurrence of disturbances in newer beds in those parts where earlier movements had affected older beds. So that, reasoning backward, where we see marked signs of disturbance for long distances in beds at or near the surface, there we may expect to find pre-existing disturbances of the older beds beneath. This, however, is a somewhat controversial question; and much remains to be done on it. But should it be proved as a general rule, it may have much effect on our underground coal. The question of the possibility of finding and of working coal in various parts of South-Eastern England is not merely of local interest; it is of national importance. The time must come when the coal-fields that we have worked for years will be more or less exhausted; and we ought certainly to look out ahead for others, so as to be ready for the lessening yield of those that have served us so well.

The above subjects were also referred to in two papers read by Mr. J. Francis, M.Inst.C.E., and Mr. F. W. Harmer, F.G.S., before the Geological Section.

The title of the paper by the first-named gentleman was "The Dip of the Underground Palæozoic Rocks at Ware and at Cheshunt." In it the author called attention to the fact that some geologists interested in ascertaining the lie of the ancient rocks beneath the eastern counties are doubtful whether reliance can be placed upon statements that have been made with regard to the dip of the rocks found in deep borings at

Ware and Cheshunt. He remarked that, though much time and money had been spent in obtaining the angles and directions of dip at these places, no description of the methods adopted had been published; and he now proposed to give a short account of what had been done.

The borings were undertaken by the New River Company, with the object of procuring water from the lower greensand. The bore-holes were accordingly put in hand; but, on reaching certain depths, it was seen to be hopeless to expect water from below the gault. Orders were about to be given for a cessation of the work, when a wish was expressed by certain geologists that endeavours might be made to learn the direction of the dip of the lowest stratum reached in each case. The Directors of the Company thereupon gave instructions for the necessary investigation to be made at their expense. A number of scientific men formed themselves into a committee to arrange the modes of procedure; and, under their advice, the various experiments were carried out.

Before the year 1872, a deep well and boring had been formed at Turnford. In 1874, arrangements were made for deepening this bore; and an iron tube, 24 inches in diameter, and nearly 1000 feet in length, was provided for conveying the expected supply of water to the surface. For some time the hole was sunk by the old system of breaking up the material with chisels. But in 1878, the method of boring by means of diamonds had been perfected; and it was then decided to obtain an early solution of the question by drilling, in this more expeditious way, a hole at Ware, six miles north of Turnford. In the end, however, the gault was pierced through at both places at about the same time. The author then described the method of boring through rock by the use of diamonds, and pointed out the advantages of the system; but he remarked that, though the exact angle of dip of the material passed through could be accurately ascertained, the rotation of the apparatus precluded all knowledge of the direction of the dip. Consequently, special means had to be devised for this purpose.

After making allusion to the disappointing results attained shortly before, at the boring carried out by the Metropolitan Board of Works at Crossness, and at that made by Messrs. Meux at Tottenham Court Road, particulars were given of the finding of the palæozoic rocks at Ware and at Cheshunt. The various appliances, magnetic or mechanical, either suggested or used, for obtaining the directions of the dips were described and illustrated by diagrams. The difficulties and temporary failures that occurred were referred to, as also the means adopted for obtaining complete corroboration of results. The conclusions arrived at were then stated. At Ware, at a depth of 828 feet below the surface, and 31 feet below the top of the stratum, the silurian rock dips at an angle of 41 degrees, and in a direction that is 1 degree west of south. At Turnford, at a depth of 994 feet below the surface, and 14 feet below the top of the stratum, the Devonian rock dips at an angle of 25 degrees, and in a direction that is 17 degrees west of south. It was pointed out that at both places these ancient rocks dip in directions lying between south and south-south-west; and by placing on a geological map of the south-eastern portion of England lines to show the ascertained bearings, it was demonstrated that the greatest inclinations of the strata were, roughly speaking, at right angles to the directions of the chief axes of the weald.

Attention was then called to statements made, without due authority, soon after the completion of the work, alleging that the general direction of the dips had been found to be towards the south-east—a misconception that it was desirable should be removed. It was mentioned that no trouble was spared to attain satisfactory results—more than a month having been devoted to the ascertainment of the direction of the dip at each place; while the composition of the committee was a guarantee that the methods employed were the best adapted for the purpose. With regard to the still more important question that the New River Company undertook to solve—viz., that of the existence or the non-existence of the lower greensand beneath the district north of London—it was contended that, considering the importance of the question, there was no reason for regretting the large expenditure thereby incurred. The results of the experiments might unquestionably be accepted as perfectly trustworthy.

The paper by Mr. Harmer dealt with the importance of extending the work of the Geological Survey of Great Britain to the deep-seated rocks by means of boring. He remarked that the systematic exploration of the subterranean geology of these islands is equally important from a scientific and a practical point of view. At present our knowledge of the structure of the rocks which form the foundation of our island home is due either to isolated and occasional borings or to deep wells sunk by mercantile firms. But the latter do not reach farther than is necessary to obtain a supply of water; and the work is generally suspended just where it becomes geologically most interesting. Such a survey, however, is important practically, because unsuspected sources of wealth may be hidden under our very feet. It is a mistake to suppose that a discovery such as that of a new coal-field would enrich only the landowners of the district, because whenever any appreciation of real property takes place, the State at once claims its share of the increased value, both for Imperial and local purposes. The discovery of a new coal-field would cause increased prosperity in the district in which it occurred; and from this the State, through taxation, would derive great, though indirect, advantage. The author expressed the opinion that the growing difficulty of finding employment for the ever-increasing population of these islands is a strong reason why the proposed survey should be undertaken. Part of the cost might, he suggested, be borne by the landowners under whose property any minerals were discovered. Certain districts should be selected with the consent of the local authorities, and parliamentary power taken to charge a royalty on any minerals obtained below a certain depth. Landowners would probably welcome proposals to make borings on their estates on such conditions. In the first instance, however, the subterranean limits of existing coal-fields, or mineral-bearing rocks, should be accurately mapped out; but trial borings should be undertaken in different localities, and each new boring would help to show more plainly the direction in which further investigations should be made. Much light would be thrown by such a survey on the circulation of underground waters—a matter of great practical importance. The expense of boring would be much reduced if undertaken on a large scale, as machinery and apparatus would be available again and again.

Additional Debenture Capital for the West Middlesex Water Company.—The tenders for £100,000 of 3 per cent. debenture stock of the West Middlesex Water Company (redeemable at par after the expiration of 25 years, on six months' notice), which were invited by the Directors a few weeks ago, were opened last Wednesday, with the following results: Highest tender accepted, premium £6 2s. 6d. per cent.; lowest, £5 3s. 6d. per cent.; average, £5 10s. 2d. per cent. The stock was tendered for more than five times over.

Testing a Brick Arch Roof.—The *Annales des Ponts et Chaussées* lately contained particulars of the testing of a brick arch roof at the water-works at Beaume. The works include a reservoir excavated in the rock, and covered by a brick vault of 13 feet span and 23½ inches rise, built of hollow bricks laid in mortar composed of 1323 lbs. of artificial cement to 1·3 cubic yards of sand. The arch was a circular segment composed of two rings of brick laid flat with 0·3 inch of mortar between, and covered with a layer of concrete 9 inches thick at the haunches; the whole being plastered with cement mortar ¾ inch thick. The vault abutted on "skewbacks" cut in the sides of the solid rock excavation, and a section of it about 2 feet long was tested six days after it was built by a symmetrically disposed load of cement-bags weighing about 10 tons. Half this weight was concentrated on about 3 feet at the crown, and the remainder was distributed evenly over the rest of the extrados. No cracks or settlement whatever were apparent after 18 hours' application of the load, which, however, was not increased, because "the handling of the sacks at the crown was sufficiently dangerous for the men."

The Relative Economy of Steam, Gas, and Petroleum Engines.—M. Lambotte, the chief of the technical department of the Société Anonyme Belge des Moteurs Economiques, has lately communicated to an association composed of former pupils at the Ecole de Liége some interesting comparisons between steam, gas, and petroleum engines, with special reference to the motors of the latter types which were on view at the Antwerp Exhibition last year. He adduces figures which show that the petroleum engine is the most economical up to 10-horse power; but beyond this the steam-engine is the better motor, when it is a question of long-continued work. If in that case it is desired to employ a gas-engine, the consumer will have to make his own gas. For 50-horse power, a day's work costs the same with producer gas or with steam; but in the neighbourhood of anthracite workings, the advantage would be in favour of the gas-engine. The conclusion arrived at by M. Lambotte is that this kind of motor has even now the highest economic coefficient; but it has not yet attained the 38 per cent. assigned to it by theory. Its improvement, according to him, lies in perfecting its cycle, and in making gas-generators more efficient.

The Economy of Incandescent Gas Lighting.—Dr. Schilling has furnished some particulars in regard to three installations of incandescent gas lighting in restaurants in Munich, for a year's working. In the first case cited, 26 lamps were in use; and 41 mantles were employed. The quantity of gas burnt was 5041 cubic metres (178,000 cubic feet). The number of lighting hours was 48,664; giving 1187 hours as the life of a mantle. The cost was 0·99c. per Carcel-hour. In the second case, there were 58 lamps; and 112 mantles were used. The consumption of gas was 16,979 cubic metres (600,000 cubic feet), extending over 156,091 lighting hours; the life of each of the mantles being 1394 hours. The cost was the same as in the preceding case. There were 32 lamps in use in the third restaurant; and they consumed 12,116 cubic metres (427,700 cubic feet) of gas during 111,391 lighting hours. As 78 mantles were employed, their life averaged 1428 hours each. The cost was 0·98c. per Carcel-hour. The mean illuminating power for the three installations was 3·23 Carcels (32 candles). In a business establishment in the city, having an installation of 27 lamps, the consumption of gas was 1071 cubic metres (37,800 cubic feet), extended over 9486 lighting hours. There were 37 mantles used; being at the rate of 266 hours per mantle. The average lighting power was 4·1 Carcels (40 candles); and the cost per Carcel-hour, 0·94c.

CORRESPONDENCE.

[*We are not responsible for the opinions expressed by correspondents.*]

The Oil-Gas Experiments at Bradford.

SIR,—In reference to the matters in Dr. Dvorkovitz's letter of the 20th of September, given in last week's JOURNAL, that relate to myself, I beg to remind him that on July 4, 1894, to the Bradford Corporation he promised to supply 105 cubic feet of 57½-candle power gas, or, in his own words, 1210 candles per gallon. The calculation really is $\frac{105 \times 57\frac{1}{2}}{5} = 1207\frac{1}{2}$. But he has evidently calculated his candles correctly, and then rounded off the result to an even number. On April 1, 1895, Dr. Dvorkovitz no longer employs the divisor 5; and his candles become five times too high. On April 8, 1895, he reverts to his candles of July, 1894, which are correct, and similar to those I employ (subject to the trifling correction I have mentioned above). He has since been in doubt, believing that his candles of April 1, 1895, which are wrong, might be wrong; but he is now inclined to the belief that his candles which are wrong are right. I have shown that he has no fixed idea of the value of a candle.

I would refer to his account of what it was my duty to do in respect to the carburetting arrangement at Thornton Road; but I find that Mr. Shaw, who is one of the owners, in a letter dated Sept. 20, and published in the *Bradford Observer* of the 21st, now declares that "the system of carburetting as arranged at Thornton Road is not part of our oil plant, but a suggestion of the Corporation Engineer."

Messrs. Newbigging, who are acting as the technical representatives of Mr. Isaac Smith and Mr. Shaw, have carefully avoided making any reference to the carburetting arrangement, either in their report of the 6th of August or in the letter of the 7th of September that was presented in leaflet form to the members of the Council at the meeting of the 10th of September. When it is quite settled among themselves as to who is responsible for that arrangement of carburetting, I may be willing to discuss the matter in detail with the gentleman who accepts the responsibility of the figures.

I notice that Dr. Dvorkovitz now admits that he stopped the first trial. That disposes of the previous statement, circulated and reported as having been said by him, that he "withdrew." I think it would be better for him to leave his technical advisers, Messrs. Newbigging, to deal with me. His remarks respecting what they say I said he must see are quite irrelevant, and cannot be taken notice of. When they say for themselves anything that is incorrect, I shall be able to answer them.

Dr. Dvorkovitz claimed 1210 candles, and I have found 1139 for the oil gas. Does the gas world believe that all this discussion relates to a matter of 71 candles per gallon of oil, or that it relates to an exaggeration of five? With a little patience, the matter will develop itself. Already there is a repudiation of the carburetting arrangement at Thornton Road.

I shall have occasion to revert to the subject of the Bradford oil-gas process at a later opportunity. In the meanwhile, I believe I have answered satisfactorily the points in Dr. Dvorkovitz's letter that relate to myself.

LEWIS T. WRIGHT.

1, *Victoria Street, Westminster, S.W.*,
Sept. 28, 1895.

[We have received, but too late for insertion in the present number of the JOURNAL, a letter on the above subject from Mr. Frank Wright. —ED. J. G. L.]

A New Gasholder at Spalding.—The new gasholder which has been erected at the Spalding Gas-Works was duly "opened" on Monday evening last week; the ceremony being performed by Mr. G. Hall, a member of the Gas Committee of the District Council. This is the third holder on the works; and it gives an addition to the storage of 162,000 cubic feet. The cost has been close upon £3000. During the past two or three years, the consumption of gas has largely increased in the town; and the output last year beat the record.

Shrewsbury Gas Company.—The annual meeting of this Company was held last Wednesday. The report for the year ending June 30 last stated that the available balance of profit is £3021; and the Directors recommended the authorized dividend of 7½ per cent. After paying this, £593 will remain to be carried forward. During the twelvemonth, there was an increase of 4¾ per cent. in the consumption of gas; and the unaccounted-for gas was 5·80 per cent. Coal contracts had been placed on more favourable terms than last year; and the Directors announced that they had made a further reduction in the price of gas of 3d. per 1000 cubic feet from the end of June. Reference was also made to the death of Mr. A. G. Brookes, who had been a Director since 1871, and Chairman from 1874 to 1893. The Chairman (Mr. J. S. Phillips), in moving the adoption of the report, stated that during the year an additional 486 tons of coal had been carbonized, as compared with the preceding twelve months; and 5·07 per cent. more gas had been produced from the coal—the improved results having been due principally to the generator furnaces now in use. The income from the sale of gas was £21,682, or £63 less than in the previous year. In spite of this, however, the Directors were able to further reduce the price. The amount of gas made was 142,672,000 cubic feet, as against 34,000,000 in 1863, when the Company commenced to pay a regular dividend. Alluding to the residuals, he mentioned that from tar they had realized the substantial increase of £525 by having entered into a contract for ten years; but against this must be set a decrease of £488 for sulphate of ammonia. Coal had cost £1991 more than in the previous year; and rents, rates, and taxes had advanced by £115. These latter payments now amounted to 16¾ per cent., which was equal to 1½d. per 1000 cubic feet of gas sold. In conclusion, he said the works were in the utmost state of efficiency, thanks to the able management of their Engineer and Secretary (Mr. W. Belton). The report was adopted; and subsequently the Directors' remuneration was raised from £175 to £300.

LEGAL INTELLIGENCE.

A Gas Collector Charged with Embezzlement.

At the Marylebone Police Court last Thursday, Thomas C. Lovell, aged 27, described as a labourer, of Gosberton, near Spalding, Lincolnshire, was brought up on a warrant, charged with stealing numerous sums of money, amounting in all to about £78, belonging to The Gaslight and Coke Company. Mr. R. Humphreys prosecuted. Evidence as to the arrest of the prisoner at Boston having been called, Mr. Tate, the Clerk, read the information laid by various witnesses upon which the warrant was issued for Lovell's detention. According to this, he was appointed by the Company as an automatic meter collector in 1894; a portion of his duties being to periodically collect the money in the meters, and pay it into the Brondesbury Branch of the London and South-Western Bank. A receipt for these amounts was at once forwarded to the head office of the Company. On the 17th of April, the Company received, by post, a banker's receipt for £53 10s., which was believed to be in the prisoner's own handwriting. The same day he should have reported himself at the head office, and rendered an account for the preceding week; but, as he failed to do so, one of the clerks called upon him, at his address in Purves Road, Kilburn, and asked for an explanation. He said: "I am in trouble; I cannot make up my money. I am about £15 or £16 short in my cash; and I cannot account for it at all." Subsequently, the prisoner's books were examined; and it was found that there was a total deficiency amounting to £78 16s. 9d. Shortly after the clerk called upon the prisoner, the latter left his house, and up till quite lately his whereabouts remained unknown. Mr. Curtis Bennett ordered a remand.

Reckless Waste of Water at Hanley.

Yesterday week, Elizabeth Wayte, an owner of property at Hanley, was summoned, at the instance of the Staffordshire Potteries Water Company, for causing a pipe to be so used that the water was wasted and unduly consumed. Mr. J. H. Knight appeared for the Company. The Chief Engineer of the Company (Mr. G. D. Harrison) stated that while engaged, on Sept. 6, in offices adjoining defendant's premises, he heard water running to waste. On investigation, he found, at the back of the house occupied by defendant, a tap running at full bore; and the water escaping from the slopstone into the drain. He told defendant that this was a most improper waste of the water; and she replied that her premises were so closed in by other buildings that it was necessary to leave the water running in order to clear the drains, and keep the place sweet. Mr. Harrison added that water was escaping at the rate of about 5000 gallons, or 22 tons, per day, which was ample to supply 500 persons. If 100 persons acted as the defendant had done, the entire supply of Hanley would run to waste. Mr. J. Warner, who appeared for the defence, did not dispute the facts, but pointed out that the defendant was entitled to use whatever water she required for domestic purposes; and he contended that the flushing of a drain was a domestic purpose. There was nothing, he said, in the Company's regulations forbidding the use of the water for such a purpose. The Stipendiary (Mr. H. Wright) held that there had been an undue consumption of the water, and fined defendant 20s., and 31s. 6d. costs.

On the same occasion, Alice Fresson, the wife of a drug dealer, was summoned for altering a service-pipe belonging to the Company without their consent, also with allowing the water to run to waste. It was stated that one of the Company's inspectors visited defendant's premises on Aug. 27; and in a closet he found that the service-pipe had been cut, pulled away from the wall, and turned into the pan, through which the water was running to waste at the rate of 60 or 70 gallons per hour. The attention of Mr. Fresson was called to the matter. But the same state of things existed when the inspector called the following morning; and he thereupon knocked the pipe up. Mr. G. H. Hunt, who appeared for the defence, said that, though Mrs. Fresson was the tenant of the premises, her husband carried on business there. He found that the water was escaping from a defective cistern, and sent for a plumber to repair it. It was the plumber who cut the service-pipe, and left it in the manner described. In answer to the Stipendiary, Mr. Hunt said the plumber was not present; and he had no witnesses to prove his statement. The Stipendiary said that, in the absence of such witnesses, the evidence clearly showed the defendant to be responsible; and this case was even worse than the last, as not only was water wasted, but the service-pipe had been improperly cut. Defendant was fined 20s., and 34s. costs.

New Machinery at the Malton Water-Works.—The Malton District Council have accepted a tender submitted by Messrs. Simpson and Co., of Pimlico, for a new steam pumping-engine for the water-works at a cost of £920, subject to obtaining the sanction of the Local Government Board to a loan. The provision of a new engine will, it is stated, effect a saving of about £200 a year.

Water-Works Extensions at Spalding.—In their annual report, the Directors of the Spalding Water Company state that during the past year they have anxiously considered the best means of obtaining an increased supply of water. It had been intended to re-lay the supply main from Spalding in the direction of Bourne (from which place water is obtained); but the cost was found to be too heavy. Besides, the whole of the capital having been subscribed and the borrowing powers exhausted, the Directors say that it appeared to be impossible, without an application to Parliament to sanction an increase of capital, or sacrificing the entire dividend for some years, to raise sufficient funds to meet the heavy expense. They have now decided upon the erection of a pumping-station at Bourne, to cost about £1000, by which means the delivery of water at Spalding will be raised to 234,000 gallons in 24 hours. The Directors propose to pay a dividend of 6 per cent. for the past year.

MISCELLANEOUS NEWS.

THE DVORKOVITZ OIL-GAS ENRICHMENT PROCESS AT BRADFORD.

In the note to the letter by Dr. Dvorkovitz on the above subject which appeared in the last number of the JOURNAL, it was mentioned that he asked us to publish the first report to the Gas Committee of the Bradford Corporation by Mr. Lewis T. Wright, on his experiments with the oil-gas enrichment process at the Thornton Road station. This, as promised, we now do, together with the report of Mr. W. Wood, the Corporation Gas Engineer, on the working of the process from Feb. 4 to March 9, Dr. Dvorkovitz's remarks thereon, and other documents dealing with the subject.

Mr. Wright's First Report.

1, *Victoria Street, Westminster, S.W., Aug.* 1, 1895.

To the Chairman of the Gas and Electricity Supply Committee of the Bradford Corporation.

Sir,—The previous trial of the Dvorkovitz oil-gas process, commenced on the morning of July 3, 1895, under my observation, having been suddenly suspended by Dr. Dvorkovitz on the evening of the 4th of July, it was decided by your Committee, at the meeting held on the 5th of July, that a further trial should be carried out by the Corporation officials under my supervision, and that notice should be given to the owners of the process, who had nominated Mr. Newbigging as their representative. In accordance with that arrangement, the preliminaries having been completed, I commenced, on Monday, the 22nd of July, a trial in the presence of Messrs. Thomas Newbigging and Son. The investigation having been completed to my satisfaction, I now beg to place before you a report of the results obtained, and my opinion thereon.

One of the principal objects of this process is to "crack" the oils at a low temperature by exposing them to a large amount of heating surface of a moderate temperature; and another is to utilize the oil-gas tar (called by the inventor "bye-products") in the carburetting of coal gas for the purpose of raising its illuminating power. In this latter respect, it differs from some other modern oil-gas processes, which avoid the formation of any residual tar—a material that has not hitherto been able to command much value in the market; and in order to do this, the tar is continually and automatically returned to the retorts until completely carbonized into gas and coke. For this coke, which is remarkably pure, there is some demand for metallurgical purposes. Such processes, by gasifying a larger proportion of the oil, produce a larger volume of gas per ton of oil. It is claimed for the Dvorkovitz process that the oil-gas tar produced (bye-products) at a moderate temperature has a high value for carburetting and other purposes.

The plant does not contain any automatic arrangements for regulating the temperature of the retorts; this being effected by the manual control of the oil-cocks and the flue-dampers on the retort-setting. From what I have seen of the working of the retorts, I can say that the heats are well under control. The long run of superheating surface to which the vaporized oil is exposed, enables the cracking operation to be completed, according to the invention of the inventor, without the formation of obstinate obstructions in the retort connections caused by the accumulation of pitchy or carbonaceous substances. The absence of any notable quantity of carbonaceous deposit on the interior of the retorts is also an advantage, as it will add to the durability of them. In this process, quantity of gas is sacrificed in order to obtain an oil-gas tar containing a larger proportion of light oil, that might be valuable for the enrichment of coal gas when used as a carburetting material.

In order to arrive at the enrichment value of the oil gas produced in this process, it was important that the greatest care should be exercised, not only in the method of photometry employed, but also in the illuminating power determinations themselves. The method of photometry adopted was especially designed to neutralize any variations in any of the instruments employed as parts of the photometers, and also to make the tests on the coal gas and the enriched gas at the same times. The quality of the coal gas is continually varying within certain limits. The same remark applies to the quality of the enriched gas; and in order to avoid the possibility that by any chance a greater number of tests might fall on the coal gas when it was low in quality than on the enriched gas in the same condition, or *vice versâ*, I had previously decided to adopt only the method of making simultaneous tests on both the coal gas and enriched gas, and when the enriched gas tested should correspond to the coal gas that was being tested at the same times. The other method, of alternately testing the coal gas and the enriched gas in the same photometer, is open to the objection that the enriched gas tested does not actually represent the coal gas that has been tested, but the coal gas of other periods.

To carry out the simultaneous system of testing, it is necessary to employ two photometers; and as any part of these, such as the meters, or discs, or mirrors, or burners, &c., might have trifling deviations, it was decided to neutralize these by taking an equal number of tests of each kind of gas on each photometer. In this manner, on each run of twelve hours, there were taken twelve tests of each kind of gas; six tests of each kind being made on No. 1 photometer, and six on No. 2 photometer. Between the third and the fourth, the sixth and the seventh, the eighth and the ninth tests, the gases were reversed on the photometers—an hour being allowed on each change for the gas to become normal on the photometers.

The burner employed was the 15-hole Argand, fitted with a 7-inch chimney, and consuming the gas at the rate (uncorrected) of 5 cubic feet per hour, as prescribed in the Special Act of Parliament. To have adopted any other burner or rate of consumption would have been to throw the results out of accord with those hitherto obtained in Bradford. In recording these results, I call your attention to the mode of testing, in case you should have occasion to compare them with those obtained in other places with other burners. It is a general practice to state the enrichment values of any material in this manner, which is, strictly speaking, the enrichment effect produced on the burner consuming each quality of gas—both the coal gas and the enriched gas—at the same rate; and as it frequently happens, as in this case, that the burner with length of chimney employed is more severe upon gas of a low quality (say 15 or 16 candles) than upon gas of 18 candles, when burning at the rate of 5 cubic feet per hour, it follows that the enrichment value of the oil gas obtained is more than that which would be obtained from direct tests upon the oil gas employed; and the expression "enriching value" is employed to distinguish the results obtained in this manner of testing both qualities of gas in the same burner and at the same rate of consumption.

I made a series of tests at Bradford in order to determine the efficiency of the burner and chimney employed with various flame-values. This matter is more of scientific than of practical value in the present case, as the position of a gas undertaking having in its Act of Parliament a prescribed system of testing is that of desiring to know what effect a certain proportion of enriching material has in improving the light in the burner used in the manner prescribed in the Act; and for that reason I think it better not to depart from the custom. All the photometric results are corrected to 5 cubic feet of gas at 60° Fahr. and 30 inches barometer. They are, I consider, highly satisfactory.

From the *résumé* of the three 12-hour runs, it will be observed that the cost of enrichment is 0·76d. per 200 candles; that being the amount required to raise 1000 cubic feet of gas by one candle per 5 cubic feet. Referring to the calculation of the cost of enrichment, it will be noted that the total quantity of oil used in the three runs was 433 gallons (corrected to 60° Fahr.). The specific gravity of the oil was ·8866; and one ton will contain 252·6 gallons. At £4 per ton, delivered in Bradford, the cost of the oil is 3·8d. per gallon.

Wear and Tear.—This I estimate at 4d. per 1000 cubic feet of oil gas produced.

Gas added to the Bulk.—It is necessary to credit the process with the value of the 30,167 cubic feet of gas added to the bulk. To this item I would draw your attention, as it is an important factor in reducing the cost of enrichment. I have calculated the value of this from the cost of gas into the gasholders at Bradford during the three years 1891 to 1893, when the quality was 18·83 candles. The average cost during these three years was 14·5d. per 1000 cubic feet; and the value of the increase of bulk of gas of 17·74 candles per 5 cubic feet is taken at 13·66d. per 1000 cubic feet.

Oil-Gas Tar.—The value of this residual is determined from its value as a carburetting material, and that of the residue left from this operation as an article of sale.

Carburettor Trials.—The oil gas used in the carburettor was the quality condensed out from the oil gas in the condensers attached to the retorts. It has a specific gravity of 1·011 at 60° Fahr. In the first trial, on the 25th of July, 400 lbs. (equal to 39·56 gallons) were weighed into the carburettor, which is heated by the exhaust steam from the exhauster engine that drives a portion of the coal gas to be enriched through the carburettor. The tar in a short time commenced to boil. The carburettor is virtually a tar-still, and is provided with a condenser, through which the gas, supersaturated with the vapours boiled from the oil-gas tar, passes on its way to the gas-main. In this condenser the oils re-condense, and are again returned to the carburettor to be re-distilled and re-condensed. The specific gravity of the oils running from the condenser on the first trial was ·900. At the end of three hours, it was apparent that, though the oils were distilling rapidly and condensing in the condenser, there was no further enriching effect on the coal gas. The trial was then stopped; and it was found that the tar remaining (including the oil that drained back from the condenser) weighed 338½ lbs., and, having a specific gravity of 1·056, was equal to 32·06 gallons. The loss had therefore been 7·5 gallons. The quantity of gas enriched was 88,000 cubic feet of 16·80 candles, increased to 17·46 candles per 5 cubic feet corrected, or an increase of 0·66 candle per 5 cubic feet. This is equal to an enriching value per gallon of oil-gas tar, of—

$$\frac{88{,}000 \times 0{\cdot}66}{5 \times 39{\cdot}56} = 293{\cdot}6 \text{ candles.}$$

If the enrichment be calculated on the 7·5 gallons of oil vaporized, it gives a value of 1548 candles per gallon.

This oil-gas tar, in its crude form, is not, in my opinion, a desirable material for carburetting purposes. In this process, the coal gas is being continually exposed to a stream of the condensed oil, and it is impossible not to doubt that some of its illuminants will be washed out; and though a portion of these may be recovered at each re-distillation, it is very likely that, in the varying circumstances of practice, this may not always be the case. For the sake of such a small amount of enrichment, it would be better not to use the oil-gas tar in this manner, but to have it distilled and the lighter portions fractionated, in order to recover those oils that are suitable for carburetting, and that will vaporize and remain in the gas in one passage through the carburettor. However, valuing the oil-gas tar from the result obtained (calculation attached), I find that it is worth 1·71d. per gallon.

A trial of the carburettor on the 26th of July, conducted on the lines previously adopted, and running the oil-gas tar through the carburettor at the rate of 4·17 gallons per hour, gave an enrichment of only 0·09 candle per 5 cubic feet (*vide* photometric tests). This trial was carried out on the suggestion of the representatives of the process. The tar from the bench pots I value at ¾d. per gallon. The oil-gas tar produced in this process cannot be added to the stock of coal tar, and sold with that article, without arrangement with the contractor for the tar. Oil-gas tar differs in many respects from coal tar, and is not regarded by the tar distillers as having the same value.

In order to compare the results of this inquiry with those obtained at other places, it will be, of course, requisite to ascertain that they have been arrived at in the same manner, and that the same allowance for gas added to bulk has been made; and therefore, before results given for other localities can be compared with this, they must be compared on the basis of the circumstances obtaining in Bradford. In any case, I have no doubt that the use of oil will show an economy over cannel coal as a material for enrichment.

In conclusion, I would add that, during the tests, both Mr. Charles Wood and Mr. Sutcliffe, the Superintendent of the Thornton Road works, spared no pains in providing me with the means of conducting the tests and facilitating my inquiries.

(Signed) LEWIS T. WRIGHT.

Résumé of Three 12-Hour Runs of the Dvorkovitz Oil-Gas Process as Installed at the Thornton Road Gas-Works, Bradford.

Date. 1895.	Coal Gas Made, Cubic Feet, Corrected.	Oil Gas Made, Cubic Feet, Corrected.	Oil Used, Gallons, Corrected.	Cubic Feet Oil Gas per Gallon.	Illuminating Power in Sperm Candles per 5 Cubic Feet.			Candles. of Enrichment per Gallon of Oil.	Tar Made.			Coke Used Cwt.	Cost per 200 Candles.
					Coal Gas.	Enriched Gas.	Difference.		Condensers Gals.	Bench Pots. Gals.	Per Cent. on Oil.		
July 22 .	336,750	7,356	113·85	64·6	15·82	17·47	1·650	1202	36·50	8·7	39·7	6½	
,, 23 .	339,147	8,914	127·00	70·2	15·80	17·46	1·660	1132	37·75	4·0	32·9	6½	
,, 24 .	337,484	13,897	192·15	72·3	15·88	18·28	2·400	1107	65·00	3·0	35·4	6½	
Summary	1,013,381	30,167	433·00	69·7	..	..	1·903	1139	139·25	15·7	35·0	19½	0·76d.

Cubic feet of gas made per ton of oil = 17,599.

Cost of Enrichment by the Dvorkovitz Process.

	Pence.
Oil, 433 gallons, at 3·8d.	1645·40
Labour, 1½ days, at 15s.	270·00
Coke, 19½ cwt., at 7s. 6d. per ton	87·75
Wear and tear, 30,164 cubic feet, at 4d. per 1000 feet	120·67
Salaries, at 0·12d. per 1000 feet	3·62
	2127·44
	661·42
Cost of 385,716 candles.	1466·02

	Pence
Gas added to bulk, 30,167 cubic feet, at 13·66d. per 1000 feet	412·08
Tar, 139¼ gallons, at 1·7d. per gallon	237·57
Tar from bench pots, 15·7 gallons, at 0·75d.	11·77
	661·42

Cost per 200 candles, or cost of enriching 1000 cubic feet of gas by 1 candle per 5 cubic feet is—

$$\frac{1466{\cdot}02 \times 200}{385{\cdot}716} = 0{\cdot}76\text{d.}$$

Statement of Candles (120 grains sperm) Obtained from 433 Gallons of Oil.

Coal Gas.						Candles.
336,750 cubic feet enriched by	1·65	candles per	5	cubic feet		111,127
339,147 ,, ,,	1·66	,,	5	,,		112,597
337,484 ,, ,,	2·40	,,	5	,,		161,992
1,013,381						385,716

Statement of the Candles in the Volume of Gas added to the Bulk.

7,356 cubic feet at	17·47	candles per	5	cubic feet	25,702
8,914 ,,	17·46	,,	5	,,	31,128
13,897 ,,	18·28	,,	5	,,	50,807
30,167					107,637
Total					493,353

493,353 ÷ 433 = 1139 candles per gallon of oil.

Candles . 385,716 / Cubic feet 1,013,381 = 0·3806 candle enrichment per cubic foot of coal gas, or 1·9030 candle per 5 cubic feet of the 1,013,381 cubic feet of coal gas enriched.

Value of Oil-Gas Tar for Carburetting.

[Carburetting trial of July 25, 1895.]

400 lbs., or 39·56 gallons, of oil-gas tar (1·011 sp. gr.) carburetted 88,000 cubic feet of coal gas 0·65 candle per 5 cubic feet.

Total candles enriched $\frac{88{,}000 \times 0{\cdot}66}{5}$ = 11,616 candles.

Candles per gallon 11,616 ÷ 39·56 = 293·6 ,,

Value of 293·6 candles at ¾d. per 200 (*i.e.*, 1000 cubic feet of gas enriched by 1 candle per 5 cubic feet)—

$$\frac{293{\cdot}6 \times 0{\cdot}75}{200} = 1{\cdot}10\text{d.}$$

Value of residue after being spent for carburetting.

Residue was 338½ lbs. of 1·056 sp. gr., or 32·05 gallons, or 32·05 ÷ 39·56 = 0·81 gallon per gallon of original tar, at ¾d. . . . . 0·61

1·71d. per gal. condensed tar.

Photometric Tests—Oil-Gas Enrichment.

[Results given in sperm candles per 5 cubic feet.]

Enriched Gas.	Coal Gas.	Enriched Gas.	Coal Gas.	Enriched Gas.	Coal Gas.
July 22, 1895.		July 23, 1895.		July 24, 1895.	
18·30	15·62	15·03	13·26	17·88	15·51
18·72	16·79	17·11	14·93	17·14	15·20
18·18	16·14	18·17	16·65	19·49	15·85
17·32	16·13	17·18	14·65	17·46	15·50
17·78	16·08	17·20	14·89	17·99	15·47
18·61	17·59	18·08	16·32	17·77	17·05
17·93	15·95	18·07	16·07	18·93	16·84
16·88	15·01	17·39	15·75	19·14	17·30
16·43	14·31	18·33	17·80	18·33	15·10
15·62	14·50	17·69	16·26	18·16	15·13
17·34	16·24	17·59	16·43	19·01	16·25
16·48	15·42	17·73	16·61	18·13	15·34
Aver. 17·47	15·82	Aver. 17·46	15·80	Aver. 18·28	15·88
Difference—sperm candles per 5 cubic feet, 1·65.		Difference—sperm candles per 5 cubic feet, 1·66.		Difference—sperm candles per 5 cubic feet, 2·40.	

Photometric Tests Taken during Trials of Carburettor.

Coal Gas.	Enriched Gas.	Coal Gas.	Enriched Gas.
July 25, 1895.		July 26, 1895.	
17·23	17·23	17·18	17·57
15·54	15·73	16·17	17·00
16·10	17·60	15·60	16·05
16·26	17·55	15·63	15·19
17·70	18·30	17·91	17·33
17·97	18·34	16·17	16·04
Aver. 16·80	17·46	Aver. 16·44	16·53
Difference, 0·66.		Difference, 0·09.	

All tests are corrected to 60° Fahr. and 30 inches barometer.

Mr. Wood's Report on the Working from Feb. 4 to March 9, 1895.

Gas Office, Bradford, March 28, 1895.

To the Gas Committee of the Bradford Corporation.

Gentlemen,—I beg to submit my report on the working of the Dvorkovitz oil-gas plant at Thornton Road works, from Feb. 4 to March 9.

The plant ran continuously for the 33 days; the first half of the test being made in very cold weather. During this period we used 55 tons 1¾ cwt., or 13,910 gallons, of oil; being an average of 421 gallons per 24 hours. The meter registered 948,000 cubic feet of oil gas, at an average temperature of 43° Fahr. and 29·67 in. barometric pressure. This is at the rate of 68·15 cubic feet per gallon, or 17,209 cubic feet per ton of oil; or when corrected to the standard temperature and pressure, 70·19 cubic feet per gallon, and 17,725 cubic feet per ton. The quantity of coal gas made during the same time was 41,125,000 cubic feet; and the 948,000 cubic feet of oil gas added amounted to 2·25 per cent. of the total. Altogether, 5190 gallons of bye-products were made, equal to 37·31 per cent. on the oil used. Of these, 991½ gallons were used for carburetting; and we have left 4198¼ gallons, or 18 tons 16 cwt., equal to 30·18 per cent. by volume, or 34·17 per cent. by weight, on the quantity of oil used.

The expenses of working are about the same as stated in my last report. [See JOURNAL, Vol. LXV., p. 329.] Three men per 24 hours have done all the work, except pumping and measuring the oil and bye-products. This has now to be done by hand; but, of course, in permanent plant, a small steam-pump would do all this at a very slight cost. During the test, we only used 17 cwt. of coke per 24 hours; so that an allowance of 20 cwt. per day would be ample.

The value of the bye-products is an important item in calculating the actual cost of enrichment by this process. A sample was sent to Messrs. Read Holliday and Sons, of Huddersfield; but their tests do not help us very much to determine the value of the bye-products. We are only able to use 19 per cent. of the total bye-products for carburetting; and I do not think that, in regular working, we could use much more than this proportion, unless the bye-products were partially separated by distillation.

The oil gas, as made, was mixed with the coal gas at the outlet of the station meters; and, during the whole time, the illuminating power of the coal gas and of the mixed gas was tested as frequently as possible—420 photometer tests being made. The average illuminating power of the coal gas alone during the experiment was 15·16 candles; and that of the mixed gas, after carburetting, taken from the inlet of the holder, was 17·32 candles—giving an increase of 2·16 candles. This shows the oil gas, including the bye-products used for carburetting, to have an average enriching value of 111 candles. From the 991½ gallons of bye-products used for carburetting, 623¼ gallons were taken up by the gas, and 368¼ gallons of heavy tar left. As the result of the 33 days' test, we have therefore, per 100 gallons of oil, an average net yield of 6815 cubic feet of 111 candles enriching power, 30·18 per cent. of bye-products, and 2·64 gallons of tar. In order to test to what extent we can enrich with the bye-products, it would be best to get a few tons distilled. We could then experiment with the benzol obtained from them.

The oil cost us 4½d. per gallon; but a contract for a quantity could be made at less than this price, as now the carriage from London to Bradford alone cost 1½d. per gallon. It is better to calculate the cost into the holder in each case, as the depreciation of the rich gas when stored depends principally upon the changes of temperature. Under similar conditions, we have found it to be less in the case of oil-gas enrichment than with the gas enriched by cannel. A photometer was fixed at Lidget Green; and a large number of tests made daily showed that the Thornton Road gas had not lost in illuminating power in travelling 1¾ miles from the works.

The cost of working may be taken as follows:—

420 gallons of oil, at 4½d.	£7 4 4½
20 cwt. of coke, at 7s. 6d.	0 7 6
Three men, at 5s.	0 15 0
Interest, wear and tear—say, 15 per cent. on £750 (300 working days per annum)	0 7 6
Total cost	£8 14 4½

Total cost brought forward	£8 14 4½
If bye-products are valued at 6d. per gallon, then—	
126 gallons at 6d.	3 3 0
	£5 11 4½

And the cost of enrichment per candle-thousand—

$$\frac{£5\ 11s.\ 4\frac{1}{2}d.}{420 \times 68{\cdot}15 \times 111} = 0{\cdot}42d.$$

If the bye-products are only worth 4d. per gallon, the cost will be—

$$\frac{£6\ 12s.\ 4\frac{1}{2}d.}{3{,}177{,}000} = 0{\cdot}5d.$$

A fortnight's test has since been made at Thornton Road, to determine the cost of enrichment with cannel. In estimating this, the chief difficulty is to get the actual illuminating power of the gas from the coal alone, as the gas from both the coal and cannel is mixed in the retort-house. As the fairest way of arriving at this, we have taken the mean of the average tests of the coal gas made the week before the said fortnight. This gives the coal gas as 15·67-candle power, and certainly favours the cannel enrichment, as the coal gas would probably be better than this during the test, owing to the warmer weather which prevailed. The average illuminating power of the mixed gas at the inlet of the holder during the fortnight was 18·16 candles; being an increase of 2·49 candles, to obtain which 25 per cent. of cannel was used. The average price of cannel was 13s. 4½d.; and of the coal, 9s. 8¾d.—a difference of 3s. 7¾d. per ton. Although our present selling price of the coke and breeze from cannel are relatively higher than usual in comparison with the price of coke from coal, at these rates the value of the products from a ton of cannel is 2s. 11d. less than that of those from a ton of coal. The quantity of gas produced per ton, and the expenses of working either coal or cannel, are practically the same; so that, altogether, to enrich 10,000 cubic feet of gas by 2·49 candles cost 25 per cent. of 3s. 7¾d. + 2s. 11d. = 19·67d., or 0·79d. per candle-thousand.

The cost of cannel enrichment, as above estimated, is perhaps smaller than it has ever been previously in Bradford, and is due to the exceptionally low price of cannel in comparison with coal, and to the relatively high price which we now charge for cannel coke, but which, if we continue using cannel, probably cannot be maintained.

The annual make of gas at Thornton Road is about 350 million cubic feet; and, with the quality of coal now in use, requires about 2¼ candles enrichment in order to supply 18-candle gas. Assuming that this can be done by cannel at 0·79d. per candle-thousand, this will amount to £2592 per annum; while if done by oil gas at 0·5d., it would cost £1640, or a saving of £950.

(Signed) W. Wood.

Dr. Dvorkovitz's Reply to Mr. Wood's Report.

London, April 1, 1895.

To the Gas and Electricity Supply Committee of the Bradford Corporation.

Gentlemen,—According to your decision of the 28th of March, I beg to submit to you my remarks on the report of your Engineer about the working of the oil-gas plant at the Thornton Road Gas-Works.

First, I will point out that the test of the oil gas has been made in abnormally cold weather, during which period the illuminating power naturally showed a considerable falling off. The test of cannel gas was made in ordinary weather, and, as a matter of course, showed more favourable results. It will, therefore, be very unfair to base any comparison upon the exceptional results of the oil-gas tests during the first two weeks in February, as we were quite unprepared to cope with the difficulty; and the ordinary coal gas then showed a much greater falling off in illuminating power. As soon as arrangements were made for covering the condensers with a non-conductive felt, the oil gas at once resumed its normal candle power.

I will ask you, therefore, to base your decision upon the three weeks' working from the 18th of February to the 9th of March. The result will then be as follows: 8241 gallons of oil were used, and 575,790 cubic feet of oil gas produced, or 17,709 cubic feet per ton; the quantity of coal gas made during the same time being 23,197,420 cubic feet, of which there have been enriched—

9,156,000	cubic feet by	2·43	candles = 22,249,080 feet-candles.
8,484,000	,,	2·39	,, = 20,022,240 ,,
5,557,000	,,	2·41	,, = 13,392,370 ,,
			55,663,690 ,,

Apart from this, there has been added *to the bulk* 575,790 cubic feet of gas with an average candle power of 17·83. Therefore the total feet-candles produced from the 8241 gallons of oil is—

(1) Feet-candles added to the coal gas	55,663,690
(2) 575,790 cubic feet of gas added *to the bulk* of 17·83-candle power	10,266,336
	65,930,026

In regard to the value of the bye-products, my previous experiments have shown the maximum amount of candles produced from 1 ton of oil in the form of oil gas alone does not exceed 1,785,000 candles; therefore the 8241 gallons of oil used could produce only 58,012,500 candles, and the difference between this figure and the total feet-candles produced as above—viz., 7,917,526 candles—is derived solely from the 581 gallons of bye-products which have been used in the carburettor; representing 13,640 candles per gallon of bye-products used, or twice the candles received from the original oil. This fixes the value of the bye-products at considerably over 6d., irrespective of the value of the tar left.

The next point is the price of the material. As Mr. Wood states, the oil used was sent by rail from London at an expense for freight of 1½d. per gallon, increasing the price to the exceptional figure of 4⅛d. This, of course, is not the route which would be adopted for the delivery of a contract supply in Yorkshire. There will be no difficulty in delivering the oil in Bradford at 3⅜d. per gallon; in fact, I am prepared to contract to do so. I may remind you that Scotch oil has been invoiced to you as low as 3d. per gallon. While, however, Mr. Wood charges the oil at an exceptional price due to exceptional circumstances, he bases his price for cannel coal at a figure which he is bound to admit is so low that it cannot be relied upon. In this connection, I may call your attention to my offer of the 27th of February to charge you 4d. per gallon for the oil, and allow 6d. per gallon for the bye-products; leaving the cost of the oil actually used for enrichment at 2⅛d. per gallon.

Mr. Wood, in speaking of the added candle power, has overlooked the fact that it is impossible by this process to add candle power *without also increasing the bulk*. I have given you, by my plant, not only the added candle power to the coal gas which has been enriched, but also 575,790 cubic feet of additional gas having the same illuminating power as the enriched gas. Mr. Wood has also omitted to credit my process with 221 gallons of tar left after carburetting with the 581 gallons of bye-products, to which, though not a large item, I am entitled.

With respect to the cost of enrichment by cannel coal, Mr. Wood makes a calculation based upon a comparison between coal gas and cannel gas, stating that the cost of working the two is practically the same, but omits to point out that, when cannel gas comes into competition with the oil gas, it stands at a great disadvantage as regards labour, fuel, wear and tear, and extra purifying. I am unable to account for the extremely low price of cannel upon which Mr. Wood bases his calculation. Your last year's report gives 16s. as the average of 1894; while he takes 13s. 4½d. as the figure. You will be able to judge from your local knowledge whether this reduction is likely to be permanent. I myself should feel inclined to agree with Mr. Wood that this is indeed extremely doubtful; and I prefer to accept his previous estimate of 1d. per candle per 1000 cubic feet as the probable future average cost of enrichment by cannel.

I therefore feel justified in asking you to empower your Engineer to embody in his report the corrected facts and figures which I append in tabulated form, and from which it is clearly seen: (1) That the cost of enrichment by oil gas per candle per 1000 cubic feet is 0·27d., and not 0·42d. as Mr. Wood calculated. (2) That the average cost of enrichment by cannel coal is not less than 1d. per candle per 1000 cubic feet. (3) That the cost of enrichment of 350 million cubic feet of coal gas (yearly production at the Thornton Road Gas-Works) by 2¼ candles will be, by my process, £885, and by cannel coal £3281, *or a net saving of £2396 per year by adopting my process.*

(Signed) P. Dvorkovitz.

Table I.—*Cost per Candle Enrichment at the Thornton Road Gas-Works from Feb.* 18 *to March* 9, 1895.

8241 gallons of oil, at 3⅜d. per gallon		£128 15 4
16 tons of coke, at 7s. 6d. per ton (17 cwt. per 24 hours) . .		6 0 0
Labour, 19 days (three men, at 5s. per day)		14 5 0
Interest, wear and tear—say, 15 per cent. on £750 in 19 days, at 7s. 6d. per day		7 2 6
		£156 2 10
Less—		
Cost of bye-products, which, as it is proved by enrichment, produce exactly twice as many candles per gallon as the oil itself, and therefore their value is not less than 6d. per gallon. The net amount has been 30·18 per cent. of the oil used, or 2538 gallons, at 6d. per gallon	£63 9 0	
38 per cent. of 581 gallons, or 221 gallons of tar left after enrichment, at 2d.	1 16 10	
575,790 cubic feet of gas of 17·86-candle power added to the bulk in the holder, at 1s. per 1000 cubic feet	28 15 9½	
		94 1 7½
Net cost of 55,663,690 feet-candles		£62 1 2½
Or 0·27d. per candle enrichment per 1000 cubic feet.		

Table II.—*Cost per Candle Enrichment at the Thornton Road Gas-Works for Thirty-three Days' Continuous Working from Feb.* 4 *to March* 9, 1895 (*Based on Mr. Wood's Report*).

13,912 gallons of oil, at 4⅛d.		£239 1 6
28 tons 1 cwt. of coke (17 cwt. per 24 hours), at 7s. 6d. . . .		10 10 6
Labour, 33 days (three men, at 5s. per day)		24 15 0
Interest, wear and tear—say, 15 per cent. on £750 in 33 days, at 7s. 6d. per day		12 7 6
		£286 14 6
Less—		
4198 gallons of bye-products, at 6d. per gallon	£104 19 0	
368 gallons of tar left after enrichment, at 2d. .	3 1 4	
976,440 cubic feet of gas of 17·32-candle power added to the bulk in the holder, at 1s. per 1000 cubic feet	48 16 5	
		156 16 9

41,125,000 cubic feet of coal gas enriched from 15·16 to 17·32 candles, or by 2·16 candles; net cost per candle enrichment of 1000 cubic feet, 0·35d.

Mr. Shaw's Letter to the "Bradford Observer."

In continuation of previous correspondence, Mr. W. W. Shaw has addressed to the *Bradford Observer* the following letter, for the purpose of drawing comparisons between the cost and productive capacity of several processes mentioned by a previous correspondent (Mr. J. Cowgill),*

* It is unnecessary to reproduce the whole of Mr. Cowgill's letter. He gave therein certain figures gathered from the reports of corporations who have adopted processes of enrichment by oil; and these are criticized by Mr. Shaw. They are as follows:—

	No. of Candles per Ton of Oil.
The Huddersfield oxy-oil process, from an oil at £3 per ton and 2s. 6d. royalty; being a total of £3 2s. 6d. per ton .	3,190,000
The Peebles process, from an oil at £3 per ton and 2s. 6d. royalty; being a total of £3 2s. 6d. per ton	2,112,000
Mr. Isaac Smith's process, from an oil at £4 per ton, free of royalty.	1,443,200

Mr. Cowgill asked if, in the face of these results, the members of the Corporation could consistently vote for Mr. Smith's process being adopted at all the gas-works, until the Gas Committee had had the others tested by as stringent a method as that to which Mr. Smith's had been subjected.—Ed. J.G.L.

and of discussing the circumstances connected with the offer in regard to the Dvorkovitz process now before the Corporation :—

Sept. 20, 1895.

To the Editor of the *Bradford Observer*.

Sir,—The Huddersfield and Peebles processes are each worked with Scotch oil, costing £3 10s. per ton delivered in Bradford. The Dvorkovitz process is worked with Russian solar oil, costing £4 per ton delivered in Bradford. The following calculations are based upon the official figures of the Corporation's Gas Engineer as the results of the 33 days' test in February and March, 1895 :—

Cost of Enrichment per Candle for every 1000 *Cubic Feet o Gas Enriched by the Dvorkovitz Process :—*

55 tons 1 cwt. 3 qrs. of Russian oil, at £4 per ton		£220	7 0
28 tons 1 cwt. of coke, at 7s. 6d. per ton		10	10 6
Labour, 33 days (three men, at 5s. per day)		24	15 0
Interest, wear and tear—15 per cent. on £750 for 33 days, at 7s. 6d. per day		12	7 6
Gross cost		£268	0 0
Less—4198½ gallons of bye-products, at 4d. per gallon	£69 19 6		
368 gallons of tar left after enrichment, at 1d. per gallon	1 10 8		
976,440 cubic feet of gas of 17·32-candle power added to bulk, at 1s. 1½d. per 1000	54 18 6		
		126	8 8
Net cost		£141	11 4
41,125,000 cubic feet of coal gas were enriched by 2·16 candles		8,883,000	candles.

Or—

Net cost per candle enrichment, with bye-products at 4d. per gallon	0·383d.
Taking the bye-products at 3½d. per gallon	0·406d.
Or at Mr. Wright's valuation of 1¾d. per gallon	0·488d.

Or still under ½d. per candle.

Notes.—The Russian oil was delivered to The Gaslight and Coke Company at Beckton in 1894 at £2 17s. per ton, and was invoiced by them to Bradford at £2 19s. 4d. per ton (carriage to add). As the carriage from Liverpool to Bradford is only 10s. per ton, the oil could be obtained under £4 per ton.

Illuminating Capacity of the Dvorkovitz Process per Ton of Oil Used.

55 tons 1 cwt. 3 qrs. of oil, at £4 per ton		£220	7 0
Less—Bye-products left (30·18 per cent.), 4198½ gallons, at 4d.	£69 19 6		
Tar left after enrichment, 368 gallons, at 1d.	1 10 8		
		71	10 2
		£148	16 10

55 tons 1 cwt. 3 qrs., at £148 16s. 10d. . . . . £2 14s. per ton.

Candle power as certified by the Bradford Gas Engineer—

Dvorkovitz process (17·209 × 111), 1,910,000 candles per ton of oil	at £2 14s. per ton.
Peebles (on Mr. Cowgill's statement), 2,112,000 candles per ton of oil	at £3 12s. 6d. per ton (including royalty).

Notes.—In Mr. Cowgill's estimate of 1,443,200 candles, no account is taken of the bye-products either as such or in the shape of gas. His figure of £3 per ton for Scotch oil is too low.

It is impossible to bring the Huddersfield process into comparison, as no independent figures are available, and we have only the interested statements of the owners and officials to refer to. The process has not been adopted by any gas company outside of Huddersfield, nor by any other corporation or public body. It is condemned by several of the best engineers in the country; and doubts are expressed whether the proprietors of the Peebles process would not step in to prevent its general adoption. Efforts to introduce it at Halifax have failed.

In support of the Dvorkovitz process, we can refer to the results of 33 days' test, as shown in the official report of the Corporation's Gas Engineer. [The writer then quotes from Mr. Wood's report, already given, the portions commencing at the second paragraph, and ending with the words "quantity of oil used;" and from the words "The oil gas as made," down to "now the carriage from London to Bradford alone costs 1¼d. per gallon."]

It is thus shown that the cost of enrichment after a practical demonstration day and night in the keenest frosts of February last was between one-third and two-fifths of a penny per candle. This is reckoning oil at full price, and bye-products at less than Mr. Newbigging's valuation; while if we take the bye-products at Mr. Wright's valuation of 1¾d. per gallon, the cost still comes out at under ½d. per candle. We are, however, prepared to give double that amount (say, 3½d. per gallon); and on that basis the cost of enrichment would be only two-fifths of a penny. When suitably treated as part of the enrichment process, we consider them worth to the Corporation 4¾d. per gallon; and Mr. Dixon himself has frequently stated that he would heartily advocate the Dvorkovitz process, and (in his own words) would be "its best friend," if the cost came out at ½d. The results tabulated above give the actual candle power of the gas supplied, and were corroborated by independent tests made by Mr. Dixon's instructions about a mile from the works. The bye-products can be prepared for carburetting without causing either smell or nuisance.

For the Huddersfield process in July, 1894, the cost of enrichment by cannel was taken at 1¼d. per candle, equal to £15,625 per annum, for 1500 million cubic feet made and enriched by 2 candles; and a contract was proposed to be made with Bradford on this basis. The Corporation Gas Engineer, in his report of July 4, 1894, estimated the cost of enrichment by cannel coal as being only 1d. per candle, or £12,500 per annum.

If the cost of enrichment by the Dvorkovitz process is taken at two-fifths of a penny, as shown above, and based on the results of the 33 days' test, the annual cost of oil enrichment from 16 to 18 candles would be £5000 per annum; showing an annual saving for the borough over cannel coal of £7500 or £10,500, according to whether the cannel cost is taken at 1d. or 1¼d. per 1000 feet. This shows Mr. Smith's statement of an annual saving of £6000 to be well within the mark.

The Huddersfield terms, when their process was offered to Bradford in 1894 for Valley Road alone, involved payments for royalties, &c., of £1562 10s. per annum, equivalent to £4687 10s. per annum for the whole borough. Giving the Huddersfield process the benefit of their own estimate of cost (stated by their Engineer at a meeting of the Incorporated Institution of Gas Engineers in London, and reported in the JOURNAL OF GAS LIGHTING for June 5, 1894, at a time when their offer was before the Corporation of Bradford)—viz., 0·52d. per candle per 1000 cubic feet, with oil costing £3 7s. 6d. per ton, the saving over cannel coal at 1¼d. per candle would amount for the whole borough to £4687 10s., after deducting the charges for royalties, &c.

The saving under the Dvorkovitz process, as shown by the 33 days' test on a cost of two-fifths of a penny per candle would, by comparison, amount to £10,500. It is a fact, moreover, that were the Huddersfield process applied to the whole borough, the owners would take £4687 10s. out of the town in royalties; while Mr. Smith does not ask for a single half-penny.

It may be said that the joint test made by the experts does not give results as favourable as the 33 days' test. Granted; but this is attributable—(1) To the inferiority in the quality of the oil, as notified at the time to the Town Clerk by the firm who supplied it. (2) To the oil plant not being worked at its full capacity on account of the smaller quantity of coal gas requiring enrichment in July. (3) To the omission of any allowance for the value of the bye-products. These sufficiently account for the decrease in the number of candles per ton of oil.

With respect to Mr. Wright's reports upon this test and arrangements with the Bradford Gas Committee, I could say much; but I desire to add nothing which may cause further trouble in the Committee. I may, however, state facts, and leave the public to form their own conclusions. Mr. Wright spoke very favourably of the Dvorkovitz process to Mr. Newbigging, and said also that the carburetting was not a reliable test; and he should not base any report upon such a test of only three hours' duration. Mr. Newbigging likewise agreed; and for Mr. Wright's information, and to enable him to arrive at a reliable valuation, Mr. Newbigging sent to him a detailed analysis of a previous test of bye-products, quite sufficient to show a value of at least 3½d. per gallon. Mr. Wright took no notice of this, but adopted his figure of 1¾d. after a test which he had declared unreliable, and had said he would ignore.

The system of carburetting as arranged at Thornton Road is not part of our oil plant; but it is a suggestion by the Corporation Engineer, and is made out of old material belonging to the Corporation. We prefer to extract the valuable properties, consisting of benzol and naphtha, for carburetting in the ordinary way. Mr. Wright worked this experimental plant in his own way, and against the advice of the Corporation Engineer; and when the experts left, they promised Mr. Wood to return and work the plant in the manner suggested by him as the best according to previous experience. They did not return, however, because they agreed to ignore the unreliable results of carburetting obtained in the manner they had adopted; and yet Mr. Wright brought them into his report. Mr. Newbigging's report upon this test is subjoined; and attention is specially directed to the last paragraph.

Mr. Smith's offer has already been so fully referred to that I need only point out that his guarantee against the cost of enrichment by the Dvorkovitz process (if continued in use at Thornton Road for six months) exceeding ½d. per candle per 1000 feet, is not a sporting offer, and is not prompted by selfish considerations of benefits to himself, direct or indirect. Mr. Smith is not interested in the remotest degree in the supply of oil for any process. Speaking from actual knowledge, I can vouch for the *bona fides* of the offer; and securing, as it does, a guaranteed saving of £30 a week to the ratepayers without a particle of risk, I am astounded that it should have been so contemptuously received, and its benefits so wantonly ignored. I can only suppose that the Bradford ratepayers are so lightly burdened that a saving at the rate of £1500 a year is a matter of profound indifference to them.

After criticizing the statements made by Mr. Dixon, the Chairman of the Gas Committee, the writer closes his letter with the following general remarks :—

When I was requested by Mr. Smith to meet the Gas Committee in April, 1894, to discuss the terms upon which the plant should be erected, I offered it to them on the principle of "no cure, no pay." The Chairman of the Committee (Alderman Moulson) assured me in Committee—Mr. Dixon being present—that the Corporation would adopt and take over the process and plant at Thornton Road "if it proved a success," which he himself said would be the case "if it effected a substantial saving" upon the cost of enrichment by cannel. The result of that assurance was the agreement with the Corporation mentioned in Mr. Smith's offer; and I think I have shown, by figures thoroughly tested, that Alderman Moulson's condition of a "substantial saving" has been amply fulfilled. I have also shown that in July, 1894, Mr. Dixon accepted 1¼d. per candle as the cost of enrichment by cannel coal when he strenuously urged the Corporation to adopt the Huddersfield process. The difference between 1¼d. per candle and ½d. per candle at the Thornton Road works alone is a saving of £2187 10s. per annum, or for the whole borough (for 2 candles) £9375 per annum. Is this not substantial enough to satisfy the most exacting?

And I would ask any fair-minded Bradford man if Mr. Smith has not fulfilled his part of the bargain, and whether the treatment he is now receiving at the hands of the majority of the Gas Committee reflects credit upon the Corporation of a town which he has twice served in the office of Chief Magistrate.

I am told that, if I can convert Mr. Dixon, all will be well; and although "a man convinced against his will is of the same opinion still," I ask: Will not Mr. Dixon afford us the opportunity of discussing facts and figures? He does not appreciate our process, but is captured and possessed by the delusive figures of its Huddersfield rival. Why does not Mr. Dixon arrange a meeting of gentlemen who understand business and figures, and let the thing be thoroughly sifted, and results accepted before the next Council meeting?

I appeal to the public men of Bradford, who value the honour and reputation of their town, to take such steps as may be necessary to compel a full inquiry into the groundwork of this letter.

(Signed) W. W. SHAW.

Messrs. Newbigging and Son's Report to Mr. Smith.

5, *Norfolk Street, Manchester, Aug.* 6, 1895.

ISAAC SMITH, Esq., Bradford.

Sir,—Agreeably to your instructions, we carried out, simultaneously with Mr. Lewis T. Wright, on the 22nd, 23rd, and 24th of July, a series of experiments with Dr. Dvorkovitz's oil-gas process for enriching coal gas, now in use at the Thornton Road station of the Bradford Corporation Gas-Works; and we beg to report thereon. It is not necessary for us to refer to what had been previously done in connection with the working of the plant. We shall only describe the experiments which we ourselves have made, except to say that, generally, our results bear out the results obtained by Mr. Wood, the Gas Engineer to the Corporation.

The trials were conducted under the most stringent conditions. The temperature and barometric pressure were taken constantly during the three days, and the necessary corrections made. Two standard photometers were employed, and the two gases—the ordinary coal gas and the enriched gas—were tested on these; being changed from one to the other photometer every three tests throughout each day. At each change, the gas was allowed to blow through the fittings for at least twenty minutes. For each single test there were the usual ten observations; and at every fifth observation, the screens or discs were reversed. Thus every precaution was taken to avoid anything like error.

The oil used in these trials was not equal in quality to that used in the previous trials made by Mr. Wood and those made by ourselves. It came from The Gaslight and Coke Company, who intimated that the quality was not equal to that of the oil previously supplied by them. Notwithstanding this, the results obtained, looking at them from every point of view, are highly satisfactory. The result of the experiments is that with oil at 3¼d. per gallon, and taking the value of the bye-products at 4·695d. per gallon, the cost of enrichment per candle per 1000 cubic feet of coal gas made and enriched amounts to 0·367d.

The full figures are as follows:—

Duration of trials	1½ days, or 36 hours.
Coal gas made and enriched	1,013,381 cubic feet.
Oil used	433 gallons.
Oil gas made	30,167 cubic feet.
Average illuminating power of the coal gas before enrichment	15·70 standard candles.
Average illuminating power of the enriched gas	17·63 " "
Enrichment	1·93 " "
Bye-products obtained from the condenser	139¾ gallons.
Coke used in firing	19½ cwt.
Labour	15s. 5d.
Salaries per 1000 cubic feet of oil gas made	0·12d.

Cost of Enrichment.

433 gallons of oil, at 3¼d.	£5	17	3·25
19½ cwt. of coke at 7s. 6d. per ton	0	7	3·75
Labour	0	15	5·00
Salaries at 0·12d. per 1000 cubic feet of oil gas made (30,167 cubic feet)	0	0	3·62
Interest and wear and tear—15 per cent. per annum on £750, 1½ days	0	9	3·00
	£7	9	6·62
Less—Bye-products from condenser, 139¾ gallons, at 4·695d. £2 14 5·77			
Oil gas added to the bulk, 30,167 cubic feet, at 1s. 2d. per 1000 feet 1 15 2·33			
	4	9	8·10
	£2	19	10·52
Cost of raising the illuminating power of 1,013,381 cubic feet of coal gas by 1·93 standard candles	£2	19	10·52
Cost of enrichment per candle per 1000 cubic feet =			0·367d.

The price of 3¼d. per gallon for the oil is the same as that on which the results of other enriching processes have been based. The price of oil delivered at ports in the United Kingdom is 2⅞d. per gallon.

As regards the bye-products obtained by us, these have been analyzed by Mr. John Craven, the Chemist to Messrs. Hardman and Holden, tar distillers, Newton Heath, Manchester; the following being the result of his analysis:—

In 100 parts—
- 23·0 per cent. of 54/91 benzol.
- 12·5 " 90 per cent. naphtha.
- 40·0 " heavy oils.
- 24·5 " residue (pitch).

Taking these several products at the current prices, net, we have—

23·0 gallons of 54/91 benzol, at 11d. per gallon	253·0d.
12·5 " 90 per cent. naphtha, at 11d. per gallon	137·5
40·0 " heavy oils, at ¾d. per gallon	30·0
24·5 " residue (pitch), at 2d. per gallon	49·0
Value of 100 gallons.	469·5d.

The commercial value of a gallon of the bye-products is therefore 4·695d.

With respect to the labour employed, we desire to point out that, with continuous working of the plant over a period of 33 days' duration, the oil used was 13,912 gallons, and the cost of labour was £24 15s. Calculated out on this basis, the labour in the present tests amounts to 15s. 5d.

The average cost of enrichment by means of cannel, at current prices, may be taken at 1¼d. per candle per 1000 cubic feet. We observe that the cost of enrichment by cannel at Bradford is less than this—due, however, to circumstances which are altogether exceptional.

Taking into consideration the simplicity of the apparatus, its inexpensive character, the ease with which it can be worked, and the satisfactory results obtained, we have no hesitation in saying that Dr. Dvorkovitz's process is a most valuable one, and that the Corporation will act wisely in deciding to adopt it at their several stations.

(Signed) THOMAS NEWBIGGING AND SON, MM.Inst.C.E.

Reply by Mr. Cowgill.

In the *Bradford Observer* for the 23rd ult., Mr. Cowgill made the following reply to Mr. Shaw's letter:—

I cannot attempt to reply to the scientific portion of Mr. Shaw's letter; but there are questions of fact that even an ordinary individual can understand.

(1) As to the cost of oil used by Mr. Isaac Smith's process. Mr. Shaw, in his letter, gives the cost of the Russian oil used in this process at £4 per ton. Mr. Newbigging (the expert engaged by Mr. I. Smith with the express object of defending his interests), in his report, puts the cost of this oil at 3¼d. per gallon, which makes £3 8s. 3d. per ton, or 11s. 9d. per ton less than it can actually be purchased for. As a proof of this statement, the Town Clerk wrote, at the request of Mr. Wright, asking what was the very lowest price for large quantities that they would deliver this oil at in Bradford; and the reply he received was that they could not deliver it at less than £4 per ton net. Now, Mr. Newbigging, having taken the cost of this oil at £3 8s. 3d. per ton, or 11s. 9d. per ton less than it can possibly be purchased for, what reliance can be placed on his report, when one of the main factors on which he arrives at his conclusion is wrong? Or what reliance can be placed on Mr. Shaw's conclusion, if he takes Mr. Newbigging's report as a basis on which to work from?

(2) As to the cost of the oil used by the Peebles and Huddersfield process. Mr. Shaw, in his letter, says: "The Huddersfield and Peebles processes are each worked with Scotch oil, costing £3 10s. per ton delivered in Bradford." In reply to this, I beg to say that Mr. Shaw is wrong, as I have made inquiry of the Huddersfield Corporation; and they say that they are to-day paying £3 per ton delivered at their Huddersfield works, or 10s. per ton less than is stated by Mr. Shaw.

If I am correct in the above particulars—and I feel confident I am—then either Mr. Shaw or Mr. Newbigging, or both, must be wrong in both cases. If wrong, then their conclusions must be incorrect; and if their conclusions are incorrect, what reliance can be placed on their reports?

Mr. Wright's Replies to Mr. Wood and Messrs. Newbigging.

The *Bradford Observer* of last Saturday contained the following letters addressed by Mr. Lewis T. Wright to Mr. Dixon, the Chairman of the Gas Committee of the Bradford Corporation, in reply to the criticisms of Mr. Wood and Messrs. T. Newbigging and Son:—

Sept. 14, 1895.

Dear Sir,—I shall be glad if you will favour me by having the following reply to Mr. Wood's letter of the 3rd inst. placed before the Gas Committee at an early opportunity.

Firstly, as regards the calculations, I regret that I am not able to state that I consider his calculations to have been correctly stated. In his various reports on the subject of the Dvorkovitz process, the products obtained by multiplying the illuminating power of a gas by its volume in thousands of cubic feet is called "a thousand foot-candles," or "a candle thousand"—these two terms being employed as though one is the equivalent of the other. A careful inspection of his reports shows further that his value of "a thousand foot-candles," or "a candle thousand," is intended to apply to the quantity of enrichment required to raise the illuminating power of 1000 cubic feet by 1 candle. This value is precisely 200 candles, as everyone must be aware who is acquainted with the fact that the illuminating power of coal gas is stated, not, as Mr. Wood supposes, in candles per cubic foot, but in candles per 5 cubic feet.

Secondly, the suggestion made in my first report—that, rather than distil the crude tar with the purified coal gas, as was being done at the Thornton Road works, it would be better to have it distilled for the purpose of utilizing the lighter portion that might be profitably employed in carburetting the gas—cannot be confounded with a recommendation not to enter into the business of distilling the tar for the purpose of selling refined or partially refined products. The suggestion and the recommendation refer to matters totally different both in object and scope.

Thirdly, Mr. Wood is of the opinion that my estimate of the cost of cannel enrichment is somewhat too low. Mr. Wood must not forget that his opinions on this subject vary from time to time. On the 2nd of July, 1894, I observe that he is of opinion that cannel is likely to be reduced in the future considerably below 1¼d. per candle per 1000 cubic feet (200 candles); and in his report of the 28th of March last, he states the cost at 0·79d. He, however, is now surprised that I should arrive at a cost of 0·81d. I would point out that evidence furnished by Mr. Wood shows that the cost of cannel enrichment at Bradford must be much lower than either of the above estimates, if the statements he has made at various times are to be upheld. For instance, during the 33 days' test, the coal gas was said to have been of 15·16 candles illuminating power, and on another occasion 15·67 candles; and further on in the same report of March 28, 1895, it is stated as being 15·75 candles.

With 25 per cent. of cannel, it is easy to see that, if the gas as delivered to the town be of 18·83 candles illuminating power (and that is the average of the three years ended March, 1893), then the enriching value of the cannel must be over 28 candles. Thus, with coal gas of the different values stated, to give gas of 18·83 candles, the cannel gas must have had the following values:—

Value of Coal Gas.	Enriching Value of Cannel Gas.
15·16 candles	29·8 candles.
15·67 "	28·3 "
15·75 "	28·1 "
Average	28·7 "

So that, from the report referred to, it would appear that the enriching value of the cannel gas at Bradford is 28·7 candles.

As regards the price of the cannel coal, from the figures supplied to me by Mr. Wood, the present contracts include cannels ranging in price from 9s. 6d. to 15s. per ton; and the average, according to the various quantities of each kind, is 13s. 3½d. per ton. With cannel of

an enriching value of 28·7 candles, and costing but 13s. 3½d. per ton, it will be necessary to show that the whole of the bye-products from the cannel coal—viz., coke, tar, and ammonia—are only worth to the Committee 2s. per ton of cannel carbonized before a fraction can be put on to my estimate; and with the lowest possible prices and yields of coke, tar, and ammonia, it will be exceedingly difficult, in the face of Mr. Wood's report of the 28th of March last, to prove that the cannel enrichment is costing more than 0·70d. per candle of illuminating power per 1000 cubic feet (200 candles), as it will be also to show what circumstances have happened since March, 1895, that will justify his statements to the Committee on the 21st of August last that the cost was now, on account of the difficulty of selling cannel coke, over 1d.

The reason I did not, and do not, adopt Mr. Charles Wood's figures in this case of cannel enrichment—figures that lead fatally to the contradiction of his most recent views on the subject—is because it appears to me that the enriching value of over 28 candles is too high for the class of cannel coal used at Bradford, and too favourable to that source of enrichment, and consequently unfavourable to oil. I have preferred to adopt as a basis a class of cannel I have, among others, thoroughly examined on the large scale, and the qualities of which I can personally vouch for. It has but the enriching value of 23 candles—over 5 candles less than what Mr. Wood's figures would show to be the case at Bradford. It costs 3½d. per ton less.

I will examine Mr. Charles Wood's objections to my estimate, which is higher than is shown by his figures, and his definite statement that the cost is 0·79d., and yet he to-day considers as being unfairly low. The gas liquor, he says, is taken at too high a value. From figures supplied to me by Mr. Charles Wood, the Bradford Corporation obtained 0·84d. per gallon of 10-oz. liquor for the year ended March, 1893. In that period, sulphate of ammonia varied from (monthly averages) £9 15s. 7½d. to £12 0s. 4d. At the present time, it is true, sulphate is abnormally low, though it has been £11 7s. 6d. this year. I think the basis of the year ended March, 1893, with an average of £10 4s. 8d. per ton, is a fair one.

The calculation by which, at the close of his letter, Mr. Wood arrives at the conclusion that, if my cannel estimate had been calculated on some other basis, it would lead to the result of 0·98d. instead of 0·81d., is based upon two fallacies. In the first place, it deals with the case of the enrichment of 18¾ to 23 candle gas. This, however, is not the matter before the Committee, which is the enrichment of 15¾ to 18¾ candle gas—a very different matter, as the Committee is aware. In the second place, this calculation is based upon the belief in an impossibility—namely, the enrichment of 18¾ to 23 candle gas with a material of an enriching value of only 23 candles. Mr. Wood has forgotten that if, by mixing a low with a high grade gas, there is an enrichment of the lower-grade gas, there is at the same time a dilution of the higher-grade gas; and any dilution, to whatever small extent, of 23-candle gas with 18¾-candle gas must result in something less than 23-candle gas. Any calculations that have not exposed this fallacy to Mr. Wood show how little value they have when not employed with due consideration.

I shall be glad if the Committee will allow this letter to receive the same publicity that has been permitted to the letter to which it is an answer.

(Signed) LEWIS T. WRIGHT.

Sept. 21, 1895.

Dear Sir,—Messrs. Newbigging's letter to Mr. Isaac Smith, dated Sept. 7, demands some reply from myself owing to the forced circulation that has been given to it.

This firm endeavour to show that the cost of cannel enrichment at Bradford must be higher than my estimate of 0·81d., and have, by means which can be immediately exposed, been able to raise it to 0·952d. In order to do this, statements are made that the returns of the Bradford Gas Department show to be untrue.

In the first place, cannel is taken as costing 14s. 6d. per ton. The present Bradford contracts range from 9s. 6d. to 15s. per ton; and the average is 13s. 3½d. It is asserted by Messrs. Newbigging that the ammoniacal liquor is only worth 0·5d. per gallon of 10 oz. At Bradford, the following figures have been obtained:—

Year ending.	Average per Gallon.
March, 1891	0·94d.
,, 1892	0·85d.
,, 1893	0·84d.

According to Mr. Newbigging, jun.—for it was Mr. Newbigging, jun., who presented himself as the Mr. Newbigging allowed by the Committee to be present—the unenriched coal gas had an illuminating power of 15·7 candles (per 5 cubic feet). Mr. Wood has stated it to be from 15·16 to 15·75 candles. It is asserted that a cannel cannot be obtained at 13s. per ton with an enriching value of 23 candles.

The parties who have questioned my statement have placed themselves upon the horns of an awkward dilemma. The average illuminating power of the town gas during the three years ending March, 1893, is stated at 18·83 candles. If the unenriched gas be 15·75 candles, then, if the cannel used at Bradford have a lesser enriching value than 23 candles, the town gas must be less than 17·56 candles. Thus—

		Candles per 5 Cub. Ft.
75 p. ct. unenriched gas	0·75 × 15·75 candles per 5 c. ft.	= 11·81
25 ,, cannel gas	0·25 × 23·00 ,, ,,	= 5·75
	Average	17·56

If the town gas be, as it is stated to be, of 18 83 candles, then, if the average cannel employed have an enriching value of less than 23 candles, the unenriched gas must be more than 17·44 candles. Thus—

		Candles per 5 Cub. Ft.
75 p. ct. unenriched gas	0·75 × 17·44 candles per 5 c. ft.	= 13·08
25 ,, cannel gas	0·25 × 23 ,, ,,	= 5·75
	Average	18 83

The price of the cannel coke in my estimate—viz., 3s. 4d.—is the lowest the Committee has accepted for some time; the average selling prices having ranged from 4s. to 10s. per ton from January, 1890, to May, 1895. This immediately disposes of the question of my having overvalued the cannel coke.

The remark made by Messrs. Newbigging that it is well known that many high-class cannels yield worthless coke, is only a portion of the truth. It is that portion of the truth that it was convenient should be known. They might with equal truth and more candour have said "It is well known that many high-class cannels yield excellent coke, and one of them, not the least celebrated for the high quality of the gas it yields—viz., 38 candles—is famed for the excellence of its coke." High-class cannels have nothing to do with the case in point, nor can they be obtained at prices at all approaching 13s. 3½d. per ton. I have been studying these matters for 23 years, and am not aware that the firm that question my statements have ever exhibited any special knowledge on the subject of cannels and their distillation products. The criticism respecting the quantity of tar is too trifling to discuss. My note-books are open to the inspection of the Committee. I claim that Messrs. Newbigging have completely failed in their criticism of my cannel estimate, which they cannot increase by 1-100th part of a penny, even if it be now convenient for them to attempt to do so. Their estimate of 1¼d. is unsupported by the most meagre of data. It is a rough guess, and not a seriously considered estimate.

As regards price of oil, this was obtained for me by the Committee, who asked for a quotation for a contract supply. It accorded with previous offers of large quantities. As regards its quality, I must point out to the Committee a matter that appears irregular. The trial was concluded on the evening of the 27th of July, and some days were required to calculate out the results. My report was finished and dated the 1st of August. In the letter from Messrs. Newbigging to Mr. Isaac Smith appears an extract from a letter, dated the 31st of July, replying to one from the Town Clerk, in which Messrs. Bessler, Waechter, and Co. are said to write: "We are not surprised to learn that the results obtained from the waggon of oil recently supplied to you were not anything like so good as those obtained from Nobel's oil," &c.

This statement about the quality of the oil was not made with my authority. It must have originated from someone not acquainted with all the facts upon which an opinion could be based, for Mr. Newbigging, jun., was pledged to me not to divulge the results until they were complete. I cannot understand how and why the results should have been prejudged in that manner before my report was written and the result known to me. Traces of this correspondence taking place without my knowledge during a period when secrecy had to be observed, to prevent wild rumours being circulated, appear in a letter from Messrs. Newbigging to their client, and is correspondence prejudging the case before it was completed. The oil used came from the Kerosene Company, and is described as, and answers to, their best Solar oil. It gave 69·7 cubic feet of gas per gallon, with 35 per cent. (by volume) of tar. The former oil gave 68·15 cubic feet of gas, with 32·82 per cent. (by volume) of tar. As regards the enriching value of the gas, this was equal to 1139 candles per gallon of oil passed through the retorts, or 1753 candles per gallon of oil gasified (deducting tar). The result will appear to reasonable people quite normal, and should satisfy all but the insatiable.

The real matter at issue in this case is not the cost of the cannel enrichment, which, as far as Bradford is concerned, cannot be shown to exceed my estimate of 0·81d., nor is it the quality or quantity of gas made from the oil, nor any other of the trifling matters which obscure the real matter at issue, which is the value of the oil-gas tar or bye-products. After the investigation I have made, it is no longer possible to say that any portion of these have a value of 350,000 feet-candles per gallon when used for carburetting. That they have a net value for sale on distillation of 4·69d. per gallon, is equally impossible. The figures given in my report will be found to be the true ones; and I cannot hold out any hopes to the Committee that a higher value than 1·7d. is possible.

(Signed) LEWIS T. WRIGHT.

The Amersham, Beaconsfield, and District Water-Works Company, Limited, has been registered with a capital of £7000, in £1 shares, to supply water to the towns of Amersham and Beaconsfield, in Buckinghamshire.

Extensions at the Rhyl Gas-Works.—The Rhyl Urban District Council have placed orders with Messrs. Westwood and Wright for a 60,000 cubic feet gasholder, and with Messrs. G. Waller and Co. for a 10,000 per hour exhauster and steam-engine.

Another Munificent Gift to Belper.—At the meeting of the Belper District Council last Wednesday, the Chairman (Mr. Herbert Strutt, J.P.) made another generous gift to the town, and one which will benefit the whole body of ratepayers. For some time an additional water supply has been under consideration; and boring operations have been carried on. Mr. Strutt has paid the whole of the expense up to the present, amounting to about £500. Now he has undertaken to contribute £4000 to enable the engineers to sink a well. If water is found in sufficient quantity and quality underground, it will obviate the necessity for application to Parliament, and avoid compensation. The father of Mr. Strutt died last Easter; and, as may be remembered, he gave to the town the whole of the property of the Water Company, which represented a cost of about £16,000 or £17,000.

The Gas Supply of Boyle.—Owing to the stoppage of the gas-works at Boyle (Co. Roscommon), great inconvenience has been caused to the inhabitants. We learn from a local paper that the Town Commissioners have had to revert to oil for the public lighting, and that the shopkeepers and householders are obliged to use this material, with its attendant discomforts, for all purposes. The loss to the people is considerable; and, moreover, it is a distinct blow to the progress of the town. A number of the enterprising traders, however, are determined that some remedy must be found for the existing state of things. Communications have been opened up with Sligo; and the Engineer and Secretary of the Gas Company (Mr. C. B. Tully) has been requested to take the matter in hand. He has accordingly visited Boyle; and steps will now be taken to furnish the town with a supply of gas from works constructed on the best modern lines.

COMMERCIAL GAS COMPANY.

The Half-Yearly Report and Accounts.

The following is the report of the Directors of this Company for the half year ending June 30 last, which, with the accounts for this period, will be presented at the ordinary meeting of the proprietors next Thursday :—

The Directors submit the accounts for the half year ended June 30, 1895. The revenue account shows a net profit for the half year of £48,680 17s. 3d.; making, with £736 4s. 7d. received for interest, £49,417 1s. 10d. This, added to the amount brought forward from the previous half year, makes £72,935 18s. 2d. Deducting therefrom £3712 10s. for interest on debenture stock, and £637 18s. 7d. for income-tax, there remains standing to the credit of the net revenue account a balance of £68,585 9s. 7d. available for dividend. The Directors recommend that dividends be declared at the rates of 13½ per cent. per annum upon the old stock of the Company, and of 10½ per cent. per annum upon the new stock, both less income-tax; and that the difference between the declared rates and the authorized rates of 13⅜ and 10⅜ per cent., having regard to the price charged for gas, be carried to the reserve fund. The balance of the net revenue will be carried forward to the next half year.

The accounts accompanying the report consist of the usual statements. The statement of capital stock (No. 1) stands as before—viz., £715,000 paid up, out of a total £830,000 authorized. The statement of loan capital (No. 2) is also unchanged—£165,000 borrowed, out of £300,000 authorized. The capital account (No. 3) shows receipts to the amount of £880,000, out of which a total of £866,092 had been spent up to Dec. 31 last, increased to £870,863 by the expenditure of £4771 (of which £1849 was for new coin-meters and fixing, £898 for new meters and stoves, and £2024 for new mains) in the six months covered by the report. The unexpended balance at the close of the past half year was £9137. The remaining statements in the accounts are reproduced in full.

No. 4.—REVENUE ACCOUNT.

To Manufacture of gas—				By Sale of gas—		
Coals, including dues, carriage, unloading, and trimming (see account No. 8)	£68,923 4 10			Common gas, per meter, at 2s. 6d. per 1000 cubic feet	£124,114 11 6	
Salaries of Engineers, Superintendents, and other Officers at works	2,297 15 5			Public lighting and under contracts, common gas. (See statement No. 10.)	9,518 14 4	£133,633 5 10
Wages (carbonizing)	19,621 16 1			Meter-rental	£2,079 10 9	
Purification, including £1915 5s. 2d. for labour	3,477 17 2			Stove-rental	928 11 1	
Repairs and maintenance of plant and works, materials and labour (less £516 19s. 11d. received for old materials)	16,453 9 5			Coin meters and fittings	355 8 0	3,363 9 10
		£110,774 2 11		Residual products—		
Distribution of gas—				Coke, less £3715 18s. 5d. for labour	£27,405 16 8	
Salaries and wages of Officers (including Rental Clerks)	£1,391 19 8			Breeze, less £705 12s. 5d. for do.	578 16 2	
Repairs, maintenance, and renewals of mains, service-pipes, and fittings, including labour	2,587 19 11			Tar	8,661 4 0	
Repairs and renewals of meters	1,247 0 6			Ammoniacal liquor and sulphate	7,215 17 9	43,861 14 7
,, ,, stoves	1,005 6 4			Miscellaneous receipts—		
,, coin meters and fittings	308 13 7			Rents	£277 14 6	
		6,541 0 0		Transfer fees	21 10 0	299 4 6
Public lamps—						
Lighting and repairing		2,315 5 6				
Rent, rates, and taxes		6,359 13 0				
Management—						
Directors' allowance	£1,250 0 0					
Company's Auditors	75 0 0					
Salaries of Secretary, Accountant, and Clerks	1,153 2 0					
Collectors' salaries and commission	1,582 11 6					
Stationery and printing	457 12 8					
General charges	496 15 4					
		4,965 1 6				
Bad debts		1,043 7 1				
Law charges		331 8 7				
Superannuations		50 0 0				
Official Officers		96 18 11				
		£132,476 17 6				
Balance carried to profit and loss net revenue account (No. 5)		48,680 17 3				
		£181,157 14 9				£181,157 14 9

No. 5.—PROFIT AND LOSS (NET REVENUE ACCOUNT).

Interest on debenture stock	£3,712 10 0	Balance, Dec. 31, 1894	£71,093 16 4
Income-tax	637 18 7	Less—Amount of dividend paid for half year ending Dec. 31, 1894, £45,787 10s. Amount available for dividend carried to Reserve Fund, £1,787 10s.	47,575 0 0
Balance available for dividend, carried to balance-sheet	68,585 9 7		£23,518 16 4
		Balance from revenue account (No. 4)	48,680 17 3
		Dividends and interest balance	736 4 7
	£72,935 18 2		£72,935 18 2

No. 6.—RESERVE FUND.

Balance on June 30, 1895	£39,802 4 6	Balance on Dec. 31, 1894	£38,014 14 6
		Net Revenue Account (No. 5)	1,787 10 0
	£39,802 4 6		£39,802 4 6

No. 7.—INSURANCE FUND.

Balance on June 30, 1895	£28,652 7 7	Balance on Dec. 31, 1894	£28,652 7 7
	£28,652 7 7		£28,652 7 7

No. 8.—STATEMENT OF COALS.

Description of Coal.	In Store, Dec. 31, 1894.	Received during the Half Year.	Carbonized during the Half Year.	Used during the Half Year.	In Store, June 30, 1895.
	Tons.	Tons.	Tons.	Tons.	Tons.
Common	43,704	99,803 10	108,881 10	150	34,976
Cannel	3,117	—	1,111*	—	2,006
	46,821	99,803 10	109,492 10	150	36,982

* 201,864 gallons of petro'eum spirit (lower grade) used as a substitute for cannel.

No. 9.—STATEMENT OF RESIDUAL PRODUCTS.

——	In Store, Dec. 31, 1894.	Made during the Half Year.	Used during the Half Year.	Sold during the Half Year.	In Store, June 30, 1895.
Coke—tons	5,644	66,451	16,818	50,749	4,528
Breeze—chaldrons	1,450	8,454	—	8,054	1,850
Tar—gallons	218,460	1,172,172	—	1,143,432	247,200
Ammon. liq.—butts of 108 gals.	12,971	84,181	37,266	—	9,886
Sulphate of ammonia—tons	1,142	1,201¼	—	619¼	1,724

No. 10.—STATEMENT OF GAS MADE, SOLD, ETC.

Description of Gas.	Quantity Made. Meter Register.	Quantity Sold.			Quantity used on Works, &c.	Total Quantity accounted for.	Quantity not accounted for.	Number of Public Lights.
		Public Lights and under Contracts (estimated).	Private Lights (per Meter).	Total Quantity Sold.				
	Thousands.	Thousands.	Thousands.	Thousands.	Thousands.	Thousands.	Thousands.	
Common	1,135,631	59,982	992,917	1,052,899	15,141	1,068,040	67,591	5,443

BALANCE-SHEET.

To Capital—			By Cash at Bankers		£5,980 19 11
For balance, per account No. 3		£9,137 0 0	Cash in hand for current expenditure		2 200 0 0
Net Revenue—			Amount invested in Consols		66,667 2 1
For balance, per account No. 5		68,585 9 7	Stores in hand—		
Reserve Fund—			Coals	£22,636 11 4	
For balance, per account No. 6		39,802 4 6	Coke and breeze	2,798 19 0	
Insurance Fund—			Tar, sulphate, and ammoniacal liquor	21,799 8 7	
For balance, per account No. 7		28,652 7 7	Sundries	9,095 13 11	56,330 12 10
Dividends outstanding		2,119 18 6	Accounts due to the Company—		
Deposits		9,637 8 7	Gas-rental, quarter ending June 30, 1895	£19,216 4 6	
Interest on debenture stock		223 15 0	Arrears outstanding	1,940 12 9	51,153 17 3
Sundry tradesmen and others, for amount due for coals, stores, and sundries		19,775 8 8	For coke and other residual products	£5,218 17 4	
Loan from bankers		10,000 0 0	Sundries	379 3 0	5,592 0 4
		£187,933 12 5			£187,933 12 5

ALLIANCE AND DUBLIN CONSUMERS' GAS COMPANY.

The Half-Yearly Report and Accounts.

The proprietors of the above Company held their half-yearly meeting yesterday. The report and accounts which had been previously circulated among them showed that the gross receipts for the six months amounted to £134,277, and the expenditure, including interest on loan capital, to £99,914—leaving a net profit of £34,363. To this has been added £629 brought from the last account; making the total sum available for dividend £34,992. The Directors recommended the payment of dividends at the rate of 10½ and 7½ per cent. per annum on the respective shares, after paying which there will remain a sum of £1425. From this they further proposed that £1000 be added to the contingent account; the balance to be carried to the next accounts. Contracts for coals and cannels have been made on terms favourable to the Company. They will shortly be in operation, and are such, said the Directors, as would enable them at the general meeting to notify a reduction in the price of gas, to take effect over the whole of the gas limits. The report also mentioned that the market for residuals has had a downward tendency. Under this head, there has been a reduction of £3105 in the receipts for sulphate of ammonia and coke, compared with the corresponding period of last year.

By the accounts, it is seen that the capital outlay in the six months was £2455; making the total to June 30 £944,260, and leaving an unexpended balance of £5646. On share capital account, there remains £236,000 to be issued; and of loan capital there is £114,000 left to be borrowed. The total revenue of the six months was £134,276, which was derived from the following sources: Gas, £101,340; public lighting and under contracts, £6089; meter-rental, £2928; coke, £14,415; breeze, £665; tar, £4303; ammoniacal liquor and sulphate of ammonia, £4281; rents, £190; and transfer fees, £62. The expenditure amounted to £94,887, of which £74,013 was spent under the head of manufacture; £6655 on distribution; £506 on the lighting and repairing of the public lamps; £3558 for rents, rates, and taxes; £5870 on management; and £605 for law charges. The other items on this side of the account were: Bad debts, £586; abatements and allowances, £2591; and annuity account, £500. The condition of the profit and loss account has already been shown. The contingent account shows a balance to be carried forward of £3870; and at the credit of the reserve fund is the sum of £45,914. On the renewal fund (leasehold) is a balance of £903; and on the insurance fund, £2693. The quantity of common coal carbonized in the six months was 55,053 tons, and of cannel (in addition to oil spirit) 10,503 tons, beyond which 292 tons were "used." The amount of gas made in the six months was 671,869,000 cubic feet; and the estimated quantities of residuals produced were: Coke, 78,436 chaldrons; tar, 626,124 gallons; ammoniacal liquor, 1,577,249 gallons.

MANCHESTER CORPORATION GAS DEPARTMENT.

Opening of Large Show-Rooms—Ironmongers and the Gas Committee—Alderman Gibson's Aim.

Handsome and commodious show-rooms for gas-stoves and other appliances have been opened in Deansgate, by the Manchester Corporation. The building is four storeys high; the ground floor and the one above being filled with gas-stoves and other goods by all the best known makers; while the basement and top floor are used for the repairing and renovation of the stoves that have been out on hire. The place is throughout artificially illuminated by the electric light, which strikes one as being a little curious, considering the purpose for which the premises were specially designed. The show-rooms were formally opened on Monday evening last week; and, on the invitation of the Gas Committee, a large number of the members of the City Council were present. The building having been inspected, the Lord Mayor (Alderman A. E. Lloyd) declared it open. He said he had often wondered how the Gas Committee had been able to carry on their operations in connection with the hiring of gas-stoves, &c., in so restricted an area as was at their disposal at the Town Hall. They had done well to go in for larger premises; and they had been fortunate in securing a plot of land which the Improvement Committee of the Corporation, to whom it belonged, hardly knew what to do with. For the land, the Gas Committee had paid £3220; the buildings had cost £2972; and £345 had been spent on fittings and equipment—making a total of £6537. He hoped that the Committee would be abundantly rewarded by the increased consumption of gas for their enterprise in providing these handsome rooms. The Gas Committee, restless and energetic as they ever were, were never satisfied unless they were doing all that it was in the power of their department to do to make life as pleasant as possible for the citizens. Tea was afterwards served to the company in the Town Hall; and one or two speeches followed. Alderman Gibson, the Chairman of the Gas Committee, said it might be that the event in which they had been taking part would form a page in the history of the gas undertaking, full of importance to the citizens. What the Committee desired was to develop, to the fullest extent, the resources of those magnificent gas-works in which something like 4 millions of money was invested. They wanted to make gas as good and as cheap as it could be produced by any other gas undertaking in the kingdom, with the same extent of plant and resources. Regarding the encouragement of the consumption of gas by the use of penny-in-the-slot meters, the Committee were already doing a great deal in this way. No doubt Liverpool had done much more; but it must be remembered that in Liverpool the gas supply was in the hands of a Company who offered great inducements to the use of such meters. In Manchester, before they could do what Liverpool had done, they had to secure the consent of 104 people. There could be no doubt that, by the use of these prepayment meters, the comfort of dwellers in cottages would be materially enhanced, and much would be done to abate the smoke nuisance, which there could be no doubt was due to the small rather than the big chimneys, although it was the owners of the big chimneys who were most frequently dealt with for the offence. With the stoves, as with the automatic meters, the Committee, if they were to do thoroughly efficient work, must be backed up by the Council. In February, 1893, because one or two ironmongers complained of interference with their business, the Council stopped the Committee from selling stoves, with the result that, while in the year before the adoption of the resolution 1100 stoves were sold—to be fixed by somebody—in the following year the Committee sold none. It was exceedingly unlikely that anything like 1100 stoves, or even a quarter of that number, had been sold by the ironmongers in the year following February, 1893. The result was that the ratepayers could not make full use of their gas-works; and many plumbers, glaziers, &c., had been robbed of work they ought to have had. It was for the City Council to say, as he would ere long give them the opportunity of doing, whether they would allow half-a-dozen tradesmen to continue in the enjoyment of a monopoly, to the detriment of the ratepayers of the city. He wanted to reduce the price of gas to 2s. per 1000 cubic feet, and to supply 35 cubic feet, instead of 25 feet, by the prepayment meters for a penny; and he believed that, if the Committee were allowed a free hand, this could be done within a reasonable time, without interfering with private enterprise in the slightest degree.

LEICESTER CORPORATION GAS, ELECTRICITY, AND WATER SUPPLY.

Half-Yearly Reports.

At the Quarterly Meeting of the Leicester Town Council last Tuesday—the MAYOR (Alderman G. Green) presiding—the half-yearly reports of the Gas and Electric Lighting and Water Committees were presented.

The Gas and Electric Lighting Committee reported that the accounts for the half year ending June 30 last showed that the net profit, after paying interest on capital, was £12,954. Out of this, had been paid £3370, being the half-year's amount of sinking fund, and leaving a balance of £9584 to be applied at the end of the official year—March 31 next—as the Council might (under the Acts of 1878 and 1884) direct. The accounts included, and the statement set out, the result of the working of the residual products manufacture and gas-fitting business. The net amount realized by the former was £8693; and on the gas-fitting business there was a net profit of £153. During the six months, 58,226 tons of coal were carbonized. The quantity of gas made was 597,894,000 cubic feet, as against 566,437,000 feet in the corresponding period of 1894; being an increase of 31,457,000 cubic feet, or 5·55 per cent. The average illuminating power of the gas at the Belgrave Gate works was 16·83 sperm candles, and at the Aylestone Road works 17·03 candles. Referring to the abolition of meter-rents, the Committee stated that they had discussed the best method of dealing with private meters; and had authorized the Engineer (Mr. Alfred Colson), when requested, to take over any such meters now in use, on the basis of a twelve years' life—due allowance being made for recent repairs. Regarding the electric lighting department, the result of the working during the half year was a loss, after charging £588 on sinking fund account, of £951, after taking credit for £268, the profit from the electric lighting fitting business. This amount, together with £191 loss for the half-year ending Dec. 31 last, made a total loss in connection with the department of £1142.

Alderman LENNARD moved the adoption of the portion of the report relating to the results of the operations of the gas undertaking; and he explained the different items of the accounts. He said the Committee had done their best; and he regretted that the financial results, in some respects, were not better. The balance-sheet was very just and fair; and the Committee had not overvalued anything.

Mr. POCHIN seconded the motion, and thought the town was to be congratulated on the efforts of the Committee; for they had been able to relieve the rates of the town.

The motion was carried.

Alderman LENNARD proposed the adoption of the portion of the report having reference to private gas-meters. He said they had had a good deal of advice on this matter. Some said that the owners of the meters should not be compensated. But he deprecated such a course as that; for it was simply confiscation. They had been advised by others, who took the opposite extreme, to pay the owner of the meter the original cost of the meter. This, he thought, would be quite wrong; and the Committee had decided to take a medium course. To take over the meters would cost £3000 or £4000, as against the original cost of £12,000. The money would come out of the revenue account; and the cost of redeeming the meters be spread over three half years. This would be, he considered, a fair and equitable way of dealing with the question.

Mr. ROWLETT seconded the proposition, speaking strongly in favour of the owners being compensated.

Mr. RICHARDS moved the deletion of that portion of the report. He contended that those who bought the meters did so for their personal advantage, to escape the exorbitant meter-rents.

Alderman WOOD supported the Committee's recommendation, on the ground of common justice.

Mr. MARSHALL would not oppose the recommendation, as he believed the Committee were actuated by a desire to act fairly all round.

Alderman LENNARD, in reply to Mr. Richards, said he wished to disabuse his mind of the idea that it was the users of meters who were responsible for the gas profits. The fact was the undertaking gained nothing from that source, as it cost all the amount of the rent to keep the meters in repair. It was the large consumers who made the profits of the department. He also wished to point out that in Leicester they gave no big discount for the large consumers; whereas in Birmingham, and other important towns, they had a differential rate. In Leicester, they charged the same price all round, to small and large consumers alike.

The proposition was agreed to.

Alderman LENNARD then moved the adoption of the section of the report referring to the electric light, and said the income had been

£963, including £268 for the fittings business. The expenditure, apart from interest and sinking fund, was £863, showing a profit of £100 on the revenue account, although it was not till late in the winter season that they got to work with it. But after deducting the interest and sinking fund, there was a balance of £951 on the wrong side for the half year. This was a large amount; but he would prophesy that, when he made the next half-yearly report, the balance-sheet would be pretty well even, after paying the sinking fund. The actual loss on working now was only about £400; £700 of the total deficiency being on account of sinking fund. In Leicester, they were rather conservative in matters of expenditure; and the Committee fully anticipated that they would have more than double the number of lamps on the mains by the time stated.

Mr. ROWLETT seconded the motion.

Alderman LENNARD, in reply to questions, said the Committee could supply the light now continuously for the 24 hours. But the expense would be seriously increased; and they wanted to be economical until there was a general demand. As a rule, they started running about four o'clock in the afternoon, and went on till about midnight. When the electric light department was as successful financially as the gas, the Committee would probably see their way to abolish meter-rents. He hoped before long they might be able to do something more substantial than abolishing the meter-rents—they hoped to reduce the price of the current.

The motion was adopted.

The Water Committee reported that the accounts for the half year showed that the net profit, after paying interest on capital, was £5056. Out of this had been paid £2577, the half-year's amount of sinking fund, leaving a net balance of £2479, which must be dealt with at the close of the current financial year in accordance with the provisions of the Transfer Act. The Committee were glad to be able to also report that the works in connection with the Swithland scheme were progressing very satisfactorily.

The report was adopted.

Alderman WOOD subsequently made a short statement as to the existing condition of the water supply. He said the rainfall this year had been about equal to that of last year; and there had been a great deal more sunshine. Happily, they commenced the year with full reservoirs; and this had enabled them to hold out. But they would not be free from difficulty or danger if the drought was continued much longer. They had now in stock barely two months' supply. The consumption was at present 112 million gallons per month, against 82 millions a year ago; so they were consuming 25 per cent. more.

CLITHEROE CORPORATION GAS SUPPLY.

The Reduction in Price.

In the JOURNAL last week, we briefly recorded that, at the meeting of the Clitheroe Town Council on the previous Thursday, a motion to reduce the price of gas to the extent of 6d. per 1000 cubic feet was carried by a majority of one—eight votes being given in its favour as against seven in support of an amendment. This was very close voting; and it showed clearly that the Council were pretty evenly divided on the question of the policy which was ultimately adopted. The reduction will come into operation at the end of the present financial year (March 25, 1896); and it is to be sincerely hoped that a largely increased consumption will ensue to justify the step the Council have taken. In connection with this matter, the Borough Accountant (Mr. W. J. Mitchell) prepared a tabular statement showing the progress of the undertaking in the 17¾ years during which it has been in the hands of the Corporation. This document had doubtless been well studied by every member of the Council before recording his vote; and therefore it may be of interest to reproduce some figures from it.

The quantity of gas consumed in the borough in the twelve months ending March 25 last (excluding that used for the public lighting) was: For domestic purposes, 18,236,600 cubic feet; for manufacturing purposes, 6,728,400 cubic feet—together 24,965,000 cubic feet. On this quantity, Mr. Mitchell showed that the proposed reduction of 6d. would lessen the income by £624 2s. 6d. To compensate for this, an increase to the extent of 5,992,000 cubic feet, or 31·75 per cent., would be required in the quantity of gas consumed. This figure was arrived at by taking the average price received last year (3s. 5·26d. per 1000 cubic feet), deducting the net cost (10·19d.), and taking off the proposed 6d.—bringing the amount down to 2s. 1d. in round numbers. Now the greatest annual increase recorded is 1,611,900 cubic feet, or 8·83 per cent.; and the average annual increase since the Corporation bought the works has been 2·81 per cent. Between these figures and the 31·75 per cent. which, as Mr. Mitchell shows, will be required, there is a great interval. Coming to the profit realized by the undertaking, in the first few years, down to 1882, the balance rose; but a reduction of 1d. per 1000 cubic feet in that year resulted in a deficit of £360. This, however, was soon recovered; and at the end of the financial year in 1885 the balance was £774. In September, a reduction of 5d. was made, followed by deficits for two years; then there was a recovery. There was a small debit balance in 1891; and larger ones in 1893 and 1894. Last March, however, the credit balance amounted to £604. In the 17¾ years, the profits totalled up to £5975; but allowing for the years when the balances were on the wrong side—amounting in all to £1087—the net sum carried to the depreciation fund is shown to be £4888, or an average credit balance of £274 17s. Of this £4888, the sum of £4103 has been expended on works; leaving only £785 to the credit of the fund. Mr. Mitchell remarks on this matter that ten years ago the Finance Committee passed a resolution authorizing a charge of 3 per cent. on the cost price of the works, &c., to be set aside each year to form a depreciation fund; but, owing to the reduction in the price of gas, the lower market value of tar and liquor, heavy repairs of the works, coal strikes, &c., the finances of the Gas Department have not allowed of the necessary contribution. The resolution has consequently been a dead letter. Had it been carried out, the amount now standing to the credit of the fund would have been £3687.

When Mr. J. A. Parker brought forward his motion for the reduction, he had to confess that the Gas Committee were by no means agreed as to the advisability of the step—in fact, they were about equally divided on the question. Had they been unanimous, he said he would not have dared to take the position he had done, of moving something practically contrary to their views. They had for years talked about reducing the price of gas; but there had always been something in the way. They had built a gasholder, made a tank, and extended the retort-house; and there had been an advance in the price of coal which had entailed a loss on the undertaking. Mr. Parker went on to say they had been told they ought to have a reserve fund. Well, there would, he said, have been such a fund if the money had not been spent in replacements and repairs. They could not eat their cake and have it; and they had swallowed it up. This was all very well; but there was a limit to it. He thought they might fairly expect to taste a little of the sweets as they went along, just to encourage them; and now he considered they might taste them by way of getting gas cheaper. Still, he did not wish to reduce the price and throw the burden upon the rates. If they examined the Borough Accountant's statement they would find that the proposed reduction would lessen the income by £624 per annum. This was just about the amount gained last year. If the gas had then been supplied at 6d. per 1000 cubic feet less, there would have been a loss of about £20 on the year's working. But it was hoped that this deficiency would be made up by increased domestic consumption. He did not expect it would; but they might get an increase that would make up part of it—possibly sufficient to meet the cost of necessary repairs and replacements. Other towns of similar size were making the supply of gas pay at considerably less than they were in Clitheroe; and it was not to be wondered at that they wanted to be on a par with their neighbours, and have gas as cheap as it could be made.

The motion was seconded by Mr. Whiteside, who submitted that the great objection to the proposed reduction—viz., that it would involve an increase in the rates—was more imaginary than real. He pointed out that the monthly returns of the Gas Committee showed that there was an average cost of 5d. per 1000 cubic feet less for making gas than there was last year; and he asked if they knew of anything to prevent this being maintained. In reply to this question, the Gas Manager (Mr. R. Barrett) said he did not think they could rely upon the present low rate of production. Now they had a contract on for the sale of residuals which was a favourable one, and above the market value. When this expired, they would probably have to take one that would be less advantageous.

The opposition to the proposal was led by Alderman W. Garnett, who moved an amendment to the effect that the price of gas should not be interfered with. He said he did not know of any arguments why the figure should be reduced. They had taken on the gas-works to pay for them in a term of 55 years; and at the end of that time, if they did not provide for depreciation, they would be in the position of having paid for them, but with nothing to show for their money. He well remembered, when the works were acquired—and he was a consistent and determined opponent of the purchase at the price—that the argument used to win over the town was that the rates would be reduced by the profits that would be made; and now, so far from coming up to those expectations, they were going, he believed, to commit themselves to a reduction which would require making up out of the rates. Alderman Sefton followed on the same side. He, too, feared that, if the price were reduced, the rates would have to be increased. Mr. Shaw, who said he had previously found himself in agreement with the mover of the resolution, now opposed him. He asked who was going to benefit by the proposal. He answered his own question by saying it would not be the ratepayers, but the gas consumers, who had already profited by reductions, and he objected to the benefits always going in the same direction.

The next speaker—Mr. Cowgill—supported the motion, if only, he said, as an experiment to try and bring in the 1400 non-consumers in the borough. He thought the Council should trust to these people becoming consumers—they, no doubt, having declined to use gas because it was too dear. It had been shown that previous reductions had eventually turned out to be beneficial to the undertaking; and probably this would be the case now.

The debate was closed by the Mayor (Mr. O. Garnett), who spoke against the motion. He thought they could not hope for so large an accession of consumers as would make up for the reduction in price. The works were established in 1836; and they had to be paid for in 55 years' time from 1878. Unless there was a depreciation fund, what would be their position? They were going to try an experiment with nothing to fall back upon. It was just as legitimate for him to embark in business and deliberately invite losses for someone else to make good, as it would be for him to recommend to the ratepayers that the Corporation should be in a position to make a levy on the rates for any loss in this commercial undertaking. The moral aspect was exactly the same.

The voting was then taken, with the result already recorded.

ELECTRIC LIGHTING NOTES.

Last Wednesday's meeting of the St. Pancras Vestry was most instructive to those interested in electric lighting questions. Foremost in importance came Mr. M'Gregor's motions—(1) "That the Vestry's resolution of the 31st of July last, prohibiting the London Hydraulic Power Company from supplying power to certain premises just within the parish boundary, be rescinded;" and (2) "That permission be granted for laying a service-pipe from the Company's mains, on condition that the power be used for no other purpose than is stated in the application—viz., the working of a goods lift." The Chairman (Mr. J. Thornley) having ruled that, under the new bye-law (No. 22), a rescinding resolution might be passed by a two-thirds majority, this was accordingly done. Then followed a curious discussion. Mr. M'Gregor reminded the Vestry that the Electric Lighting Committee had endeavoured to coerce parishioners into using no other power but electricity in working lifts; and he therefore asked whether there were

any lifts in the electric lighting station in the King's Road just erected by the Committee. Mr. Lamble (the Chairman of a Sub-Committee who superintended the construction of the station), after some hesitation, said he was not aware of any. But Mr. Sweet, the Chairman of the Electric Lighting Committee, admitted that there was one in the coal-yard. "What power is used?" pertinently inquired Mr. M'Gregor. Mr. Lamble: "Water power." Mr. Barnes: "And this is where they manufacture electricity!" This damaging confession by Mr. Lamble caused the greatest uproar; and the Chairman was unable to maintain order for several moments. Continuing, Mr. M'Gregor said they were told eight weeks since that electrical energy was a suitable substitute for hydraulic power; while at that very time the Committee were spending money at King's Road in building a hydraulic lift for themselves. Mr. Sweet here attempted an explanation. He maintained that it was quite possible to use electrical power to work the lift in question. If the Vestry gave permission to the Hydraulic Power Company to lay their service-pipe, they would introduce a dangerous principle. The Company's own circular showed that they supplied their power for electric lighting purposes. At this point, it was evident that Mr. Sweet could not obtain a further hearing; and amid shouts of "Vote," he was obliged to sit down. The vote was then taken —52 being for granting permission, and 2 against it. Having thus purged themselves, the next business was proceeded with. A harmless-looking recommendation of the Electric Lighting Committee that a letter which had been received respecting the lighting of the public streets by incandescent gas-lights, be simply acknowledged, raised quite a storm. Mr. Hunt asked what was the nature of the communication. Its gist should, he said, be furnished to the Vestry in the usual way. Mr. Hodgson said the letter was sneered and laughed at by the Committee; and he thought the Vestry ought to do justice to what he believed to be the coming light. The existing four miles of electric lights in St. Pancras had cost an incredible sum; and incandescent gas lighting would be a boon to the ratepayers. Eventually, it was agreed that the subject should be referred back for the Committee to report as to the nature of the letter. Then came a very serious matter. Mr. Hodgson stated that a circular-letter, emanating from the Electric Lighting Department, and headed "To Electrical Engineers and Contractors," had been issued, to the effect that the supply, after the 1st of September, would be at 220 volts, and that no single circuit would be permitted to carry more than 20 ampères. Mr. Hodgson asked on whose authority this circular had been sent out. He said he believed that fittings for 220 volts did not exist; and several engineers had told him that such a voltage was dangerous. Mr. Sweet said the high pressure only referred to the new system in the King's Road Station. Mr. Baynes, their Chief Electrical Engineer, had told him that such high voltage lamps had been in constant use, with excellent results; and even 230-volt fittings were in the market. A member here rose to a point of order. Mr. Baynes had, he said, admitted to him that day that he could not get 220-volt lamps in London, and had agreed to put up 210-volt lamps *pro tem.* Mr. Orange wanted to know who had issued the circular, if the lamps demanded could not be obtained. Mr. Sweet said Mr. Baynes had done it himself. At this, the Chairman remarked, with some feeling, that Mr. Baynes should first report such matters to the Committee, and not issue such circulars without their sanction.

Of course, we cannot see, but we may be prejudiced, why a small residential town with about 2500 inhabitants, a considerable proportion of whom occupy cottages, should be agitating itself about having the electric light; yet this is the case at Alsager, a place situated about six miles south of Crewe on the North Staffordshire Railway. No manufacturing industry is carried on at Alsager; and there are but very few good shops—most of the shopping being done in the neighbouring pottery towns. At present, gas or oil is employed for the private lighting; the roads—or "streets" as the District Council prefer to call them—being in darkness. The district is a scattered one; and, moreover, by far the larger number of the inhabitants are merely tenants of their houses. Where, then, do the special reasons for electric lighting come in? Naturally, the owners of the larger houses would like to have them lit by electricity, especially if this were done at the expense of the general body of ratepayers; but the latter would no doubt take a different view of the question. There being division of opinion on the matter in the District Council, the services of an electrician were called in to formulate a scheme. His first estimate was for plant involving an initial outlay of rather more than £7000. The working expenses were put down at about £1150; and the probable income at £2200. But, curiously enough, he omitted to provide for the repayment of the loan, although interest on the money was charged. This estimate probably staggered the Council, as they asked for another, which stands at £4000. It is stated that, as the plant estimated for would be sufficient for 40 street-lamps and 1200 private lights going at the same time, it would be quite safe to connect 1600 private lamps to the mains, seeing that not more than three-fourths would be in use simultaneously. The Council thought they would make a profit of £81 18s. per annum on the basis of a charge of 9s. for each lamp fixed. This looks very nice on paper—especially the odd 18s.; but the ratepayers want to know where it will be at the end of the first year's working? We should say very possibly swallowed up in a deficit. It seems to us to be the height of folly to entertain such a scheme as this; and, judging by the circulars which have been issued, some of the inhabitants consider its adoption will mean a 2s. rate. And where is this to come from? We question whether a place situated as Alsager is could run an electric lighting scheme successfully. At all events, if the more wealthy of the residents are enamoured of the system, let them unite their pecuniary forces and carry it out. The Council are young, and no doubt are inspired with the desire to be, as they suppose, "in the movement;" but they must be careful that this desire does not lead to the imposition of unnecessary burdens upon the ratepayers. By all means light the dark roads, but not by an unnecessarily expensive system.

Extensions are being carried out at the Derby Electric Lighting Works; and every effort is being made to complete them before the winter sets in. Three new boilers have been ordered; and an annexe is being built to make room for a new 20-horse power motor. The number of consumers has reached 194; while several others are waiting to be connected. At present the installation lights upwards of 12,000 lamps nightly. With regard to the finances, it is asserted that the undertaking has assumed an increasingly prosperous position, and that even now it more than pays interest on the outlay.

The Ratepayers' Association of Kingston, at their last meeting, discussed the question of the finances of the borough, particularly in relation to the steady rise in the rates. In this connection, some criticisms were passed upon the expenditure on electric lighting. This has already reached £16,000; and another £10,000 is about to be borrowed. Mr. W. Kemp took the lead in calling attention to this matter; and he asserted that, according to the published statement, the income from the electric light last year was £1400 less than the actual expenditure at the works. Yet, in face of this, the Corporation were proposing to extend their business, on lines which, to his mind, were very injudicious. At the present time, a 3d. rate was being levied for the purpose of supplying a light which was a luxury; and, in spite of what Mr. Preece and other engineers said, he declared that there was no reasonable prospect of the undertaking being a paying one. To his mind, Kingston could be lighted quite as efficiently, and at much less cost, by means of incandescent gas-burners. Another ratepayer—Mr. Savage—spoke of the perfect satisfaction which incandescent gas-lights had given him in his house; but he thought it would be most unwise and unbusinesslike for the Corporation to follow Mr. Kemp's advice, and not attempt to extend electric lighting. A resolution was passed, expressing the opinion of the Association that the present debt of the borough had arrived at such an amount that any further increase in unremunerative outlay must be deprecated.

Although the residents in North Bristol congratulated themselves when the Corporation consented to extend electric lighting in their direction, they find, now they have it, that it is not an unmixed blessing, especially when it suddenly fails. This experience befell a jeweller a few days ago, just as he was displaying his goods to a likely customer; and other tradesmen have suffered similarly. Fortunately, most of them have been cautious enough to retain their gas supply; and this, as the Chairman of the Gas Company (Alderman Dix) very properly reminds the citizens, is always reliable. On Saturday, the 21st ult., gas had to be used for about an hour, owing to the electric lights having gone out; and we learn from a local paper that the interruptions have already happened too frequently for the comfort of those who have taken to discarding the old light for the new one. On the following Monday, trouble, not to say danger, arose from another cause. While one of the electric cables was being tested, just outside some handsome business premises, smoke was seen issuing from the manhole over the sub-station chamber under the pavement; and, something being obviously amiss, a message was sent to the police, who despatched the fire brigade, and, by telephoning to the electrical works, had the current diverted. Meanwhile, the manhole lid having been removed, flame and smoke shot up in great body; and the alarming news that the electrical sub-station was on fire spread rapidly—causing no little uneasiness to tradespeople in the immediate locality. Although the hose-cart was taken to the place, the fire brigade would not risk an explosion by pouring water into the burning chamber; and Mr. Faraday Proctor, the Electrician to the Corporation, advised them that the best course was to let the flames exhaust themselves. A press representative who called at the central electrical works was informed by an official that only smoke came from the sub-station. But the police stated that flames shot up from 4 to 6 feet above the pavement —the dense body of smoke ascending to a considerable height; and this was confirmed by some eye-witnesses of the scene. At the electrical works, it was said that three times the ordinary pressure was being used in testing the cable; and the accident was attributed to the over-heating of temporary connections fixed in wood soaked in creosote. The occurrence happened just before five o'clock; but it did not prevent the electric light from being turned on later in the evening.

Yarmouth, like Bristol, has lately suffered from the unreliability of the electric light. Under the heading: "The Primitive Candle again in Request," the following paragraph appeared in the *Eastern Daily Press* on Monday last week: "On Saturday evening, those tradesmen whose establishments are entirely lighted by electricity were suddenly alarmed by being put into total darkness by the failure of the light. Those who had been wise enough to retain their gas-fittings quickly remedied matters—lighting the gas, and getting their outside lamps into requisition. But some who had gone so far as to do away entirely with their gas-fittings, were reduced to the extremity of sending out for candles; and this antiquated method of lighting trade premises had once more to be resorted to. The current remained off for about three-quarters of an hour, after which it gradually returned and supplied the shops with light for the remainder of the evening. At the Town Hall, a limelight exhibition was going on at the time of the failure; and it was not known by the audience till an interval in the lecture that anything had happened. The hall-keeper, however, soon had the gas chandeliers lighted; and the proceedings were therefore not interrupted in the slightest." The sudden collapse of the current only affected trade premises; all the outside arc lights burning as usual.

The main thoroughfare of Blackpool—Church Street—was plunged into darkness last Thursday night, owing to the failure of the electric light; and soon afterwards an alarming explosion occurred. It is supposed that sparks ignited the gas which had collected in two transformer boxes; and, with loud reports that startled the whole neighbourhood, the lids were blown off. Fortunately, no one was injured. Business had practically to be suspended for the rest of the night by most of the tradespeople.

The Stafford Corporation Electric Lighting Works, the foundation stone of which was laid about twelve months ago, have now been completed. The buildings, which were designed by the Gas Engineer (Mr. J. F. Bell), are handsome and substantial; and they stand side by side with the gas-works. Acting under the advice of the Consulting Engineer (Dr. John Hopkinson), the machinery and plant which the Corporation have put down are of the most approved types; and a liberal margin has been allowed to meet accidents and contingencies. The space covered by the buildings measures 130 feet by 70 feet. In the boiler-house, there are three boilers, each 30 feet long, and of a collective capacity of 1000-horse power. The furnaces will be served with the unsaleable waste from

the gas-works. Three splendid engines, with their necessary adjuncts, occupy nearly one-half of the floor space of the magnificent room in which they are placed; and an overhead crane, capable of lifting 12 tons with ease, travels the full length of the large apartment. Each of the engines is equal to 150-horse power; but, as a rule, they will be run at the lower, but more economical, load of 120-horse power. The dynamos convert the mechanical power of their engines into the corresponding amount of electrical power, with a loss of only 5 per cent. during the process, which, it must be admitted, is very near perfection. The storage department is fitted up with 112 cells; and the supply of the town can conveniently be left to these batteries during the early part of the day and after midnight. The supply is on Dr. Hopkinson's three-wire system.

THE RECENT SCARCITY OF WATER AT THE EAST-END.

The Official Water Examiner on the Situation.

In the course of his report (dated Aug. 27, and recently issued) to the Local Government Board on the condition of the Metropolitan Water Supply during the month of July, the Official Water Examiner —Major-General A. de Courcy Scott, R.E.—makes the following remarks as to the scarcity of water then prevailing at the East-end:—

It was stated in my report for the month of June that the Directors of the East London Water Company had found it to be necessary to reduce the supply of water pumped into their district, in consequence of the rapid depletion of the storage reservoirs which had been in progress. From the 15th of July, the supply was still further restricted. The water was shut off from all the mains, except those provided with fire-plugs, during from 21 to 22 hours out of each 24. The supply to three-fourths of the district was, consequently, received for only two or three hours daily. The Company are under statutory obligation to keep all mains which are fitted with fire-plugs constantly charged; and the houses and factories which are connected with these mains—representing about one-fourth of the whole number of services in the district—continued, therefore, to receive a constant supply of water. As a large number of houses in the poorer districts are not provided with cisterns for storing water, the substitution of an intermittent supply, of two or three hours' duration, for the constant supply, which had been universal, naturally resulted in serious inconvenience and considerable danger to health, owing chiefly to the impossibility of flushing the water-closets and drains as required.

The Engineer of the Company has reported that on the 27th of May the reservoirs of the Company were full to overflowing. These are capable of containing about 610 million gallons of water, exclusive of the considerable quantity lodged in the gravel between the puddle walls and the inner slopes of the reservoirs. The available quantity remaining in them on the 15th of July, when the further restriction referred to was imposed, amounted, it was stated, to only 25 million gallons, or about two-thirds of the quantity used in one day under the intermittent system of supply which came into operation on the 29th of June, as already explained.

This was the condition of things until the 23rd of July. The depletion of the reservoirs between the 27th of May and the 15th of July seems, therefore, to have proceeded at the rate of about 12 million gallons per day on the average. The balance required for the supply of the district was drawn from the River Lea, from wells, and from the Thames. The average daily quantity drawn in July from the Thames was 9,129,281 gallons; from wells, 6,223,785 gallons—total, 15,353,066 gallons. And this was, no doubt, a fairly constant quantity. If to this we add the 12 million gallons assumed to have been taken daily out of the store in the reservoirs, we arrive at a total of about 27 million gallons. The difference between this and the average quantity pumped daily into the district should represent the average amount of water which the Company were able to draw from the Lea during the period in question. The average daily supply to the district during the period from the 29th of May to the 15th of July seems to have approximated closely to 50 million gallons; and therefore the quantity drawn on the average from the Lea must, on these assumptions, have been 23 millions per diem.

The returns furnished by the Engineer show average daily quantities pumped as follows: During the week ending June 28, 56,100,000 gallons; do., July 5, 51,690,000 gallons; do., July 12, 50,409,482 gallons; do., July 19, 42,991,077 gallons. But a deduction of 10 per cent. should be made for slip and other losses, in order to arrive at the quantity actually distributed.

The discharge of the Lea at Feilde's Weir averaged in June 24,230,000 gallons per day. The return for July is not available; but the flow on the 30th of June seems not to have exceeded 20,350,000 gallons. There is probably some leakage through the weir, and the river receives the flow of some springs at points below the weir; so that the volume of the stream there is, no doubt, in excess of that gauged. Still the gauging may be taken as a basis for calculation; and it is apparent that the flow of the river from the 1st to the 15th of July approximated closely to that which, as has been shown in my annual reports to the Board, prevails during months of drought. The requirements of navigation have the first claim on the resources of the river, and may extend up to 5 million gallons in a day. It must therefore be inferred that the East London Company were taxing the resources of the river to the utmost possible extent.

It seems clear, from the reports made, that the necessity for rigorous limitation of the quantity pumped into the district was imperative, and that the measures adopted were not more drastic than the occasion required. The possibility of the continuance of the drought, which had prevailed for several months, and of accident to the main carrying water from the Thames, had to be considered; and it was absolutely necessary to endeavour to secure some small reserve of water, in order to place the Company in a position, in the latter event, to tide over the period which would be taken up in the execution of the necessary repairs.

It was apparent that the New River Company were in a position to render assistance in this emergency, since they could bring into action their reserve pumping power, and draw a larger proportion of their supply from their wells than they were doing, while restricting to an equivalent extent their extraction of water from the Lea. The Directors readily assented to the request of the Local Government Board that this assistance should be given; and they entered into an arrangement to this effect with the East London Company, which came into operation at the end of the month. At the same time, stand-posts were placed at various points on such of the mains as were constantly charged, so that the people in the vicinity could draw water throughout the day.

The gradual increase in the volume of the River Lea which ensued in consequence of the fall of rain which took place at the end of the month and since, has enabled the Directors to lengthen from time to time the period during which water is turned on to the service-mains. Seasons have occurred during which the September flow of the Lea has been exceedingly small; and it would not be prudent to revert to a constant supply until a reasonable reserve of water had been accumulated in the reservoirs.

The Action of the Local Authorities.

On Monday last week, a further conference of representatives of the various Vestries and District Boards of East London was held in the Hackney Town Hall, to consider what action should be taken with reference to the Local Government Board inquiry to be held as to the water supply of the district. Mr. G. B. Holmes occupied the chair; and among those present were Sir A. Scoble, Q.C., M.P., Mr. Bousfield, Q.C., M.P., Mr. H. S. Samuel, M.P., and several members of the London County Council. A resolution was adopted pledging the members of the conference to urge upon their respective Boards the necessity of contributing *pro ratâ*, according to population, to the cost of the inquiry. Sir A. Scoble remarked that they had not much time; but they must combine and employ one solicitor to represent the whole of the parishes. Something had been said to the effect that Mr. Bousfield and Mr. Fletcher Moulton might take up the case without fee, and conduct the inquiry for the parishes. He thought the conference had no right to expect these gentlemen to do anything of the kind. Mr. Bousfield said he had made an offer to give what assistance he could to the Vestries concerned; but he never intended that he should conduct the case for the conference. His own view of the whole matter was that a Joint Control Board for London and the surrounding districts should be formed. Such a Board, or Water Trust, he considered to be absolutely necessary; and when the matter came before Parliament, as no doubt it would, he would do all in his power to secure the appointment of such a Board. Mr. Samuel said he believed the issue of the inquiry would be that Parliament would be asked to say that such an important necessity of life as water should no longer be in the hands of private Companies. A deputation was appointed to wait on the Water Committee of the London County Council to ask their assistance in the matter. Accordingly, on the following day, the deputation attended at the offices of the London County Council, and had an interview with the Water Committee. They desired the Council, as the Metropolitan Authority, to give assistance to the East London parishes by providing Counsel, &c. Mr. G. Grocott, the Vestry Clerk of Hackney, said the Vestry had been deputed by the other local authorities to prosecute the inquiry; but as this was a question of interest to the whole of London, it was desirable that the County Council should be represented. The Chairman of the Committee (Mr. Collins) said the Council would be advised as to their powers in the matter; but no doubt they would be represented at the inquiry. At their meeting last Thursday, the Court of Common Council of the City of London decided that the Corporation should be represented at the inquiry. A special meeting of the Water Committee appointed by the East-end Vestries to prepare the case to be submitted on behalf of the consumers was held last Saturday afternoon at the Hackney Town Hall Mr. J. Bethell Holmes (Hackney Vestry) presided; and there was a numerous attendance of delegates. It was stated that fifty typical cases had been selected from each of the Hackney and Bethnal Green districts, and that a similar course would in all probability be followed by the other Vestries. The Chairman announced that the Committee had secured the services of Mr. Balfour Browne, Q.C., Mr. T. H. Bevan, and Mr. W. H. Eldridge as Counsel on behalf of the Vestries at the inquiry. It is understood that Mr. Pember, Q.C., and Mr. Cripps, Q.C., have been retained for the Company.

The Carriage of Liquid Ammonia on Board Ship.—The following notice has been issued: "The Board of Trade are advised that both the aqueous solution of ammonia and ammonia gas compressed into liquid form should be classed as dangerous goods, not only on account of the danger of explosion involved when they are contained in vessels not sufficiently strong to withstand the pressure which may be produced by a rise in temperature, but also on account of the highly dangerous nature of the gas. The following precautions should be adopted when either of these liquids is carried on board ship: It should be packed in iron vessels which have been carefully tested up to a pressure of 675 lbs. per square inch, and should be stored in a part of the ship beyond the influence of any heat from boilers or furnaces, and remote from the living quarters."

Austrian Incandescent Gas-Light Company.—The report of this Company for the year ended June 30 last states that the expectations to which the Directors gave expression in the last report have been more than realized. During the last year they have disposed of their rights and privileges in Russia, Scandinavia, and Denmark. They have, moreover, made arrangements with the Netherlands Company, which guarantee for a long time the sale of the chemical product. As a compensation for ceding the Dutch licence rights, they have obtained one-fourth in the nominal capital of the Netherlands Company—viz., £12,500. For the right in Hungary they have received 2700 shares of the nominal value of 270,000 frs. in the Hungarian Company. The original amount of 1,142,015 frs. has now been entirely written down, partly out of profits and partly out of sale of patents. The usual reserve fund stands at 225,000 frs., and the special reserve fund at 323,171 frs.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

I observe the letter by Mr. A. Wright, Convener of the Perth Gas Committee, regarding my writings concerning the retirement of Mr. T. Whimster from the post of Engineer and Manager to the Perth Gas Commission. It is, in some respects, unfortunate that in last week's number of the JOURNAL there should also have appeared a long note from myself, adhering to, and claiming confirmation of the view which Mr. Wright wishes to remove; because it is no interest of mine, and I certainly have no desire, to represent anything connected with the position of the Perth Gas Commission otherwise than is fair to all parties. Probably Mr. Wright will not object to look at the matter, as I presented it, from the point of view of one who was outside the influence of either the Sand Island or the Friarton Farm schemes. Mr. Whimster was asked to report "generally as to the condition of the gas-works, and specially as to the probable cost of removing the works to the Sand Island." He did so somewhere about the month of April last, giving the cost at which he estimated the removal. Thereafter Mr. W. Foulis, of Glasgow, was asked to report on the subject; and he did so in the beginning of August, recommending the removal of the works to a more suitable position, and adding that the proposed site at the Sand Island appeared to him to fulfil the necessary conditions. It will be observed that both gentlemen were confined to the consideration of the Sand Island site; and they reported according to the remit to them. Neither of them said it was a good site. In fact, Mr. Foulis pointed out the drawback there would be to it in the matter of getting foundations. Then the Friarton Farm scheme was brought forward; and Mr. Whimster was asked to report upon it. He did so; but again he gave no opinion, because apparently it was not asked, regarding the suitability of the site. Even before this report was submitted to the Commissioners, there came his resignation, which was placed before, and accepted by, the Commissioners at a special meeting, as it were in hot haste, as if some sudden occasion had arisen for his going. Now, all this, I think, bears out the view I gave, that Mr. Whimster probably felt himself rather obliged to report upon the capabilities of the site (the Sand Island site) than to criticize it. So far from saying, either by innuendo or insinuation, that pressure had been brought to bear on Mr. Whimster as to the selection of a site, my view rather was that the site was selected for him, and he was simply asked to report as to the cost of removal to it; and that Mr. Whimster, on a battle of sites becoming imminent, preferred to retire rather than enter into it. If this is not the real view, then, I must confess, facts may sometimes be misleading. If it be the true state of the situation, then it detracts nothing from Mr. Whimster's position. It will, however, be matter of regret that Mr. Whimster's age should have led to his retirement at a time when his employers should, naturally, have expected to receive the benefit of his great experience. To be sure, his services might have been retained as consulting engineer; but there is no mention of that—he has simply retired. Not only will the new man, as Mr. Wright states, be able to say something as to the designing of the new works, but he should also have to do with the selection of the site for them. If he has, then Mr. Whimster's work in the matter will be thrown away, and probably Mr. Foulis's too; and the whole thing will be taken up afresh. If he has not, then the situation will arise of a gas manager being appointed and told to "build a gas-works there," which every high-souled man would surely resent. Leaving this phase of the subject out of view, I must say the Commissioners are in an awkward situation. They have not agreed upon the new site—in fact, it is announced this week that Mr. Keiller, a member of the Commission, has circulated among his fellow members a statement to the effect that the removal of the gas-works to the Sand Island would cost £18,325, as compared with £16,433 to Friarton Farm; showing a difference of £1892 in favour of the latter. It is while thus divided upon a question of the most vital importance that the Commissioners are called upon to appoint a new Manager. There is danger that the man who may be appointed will receive the post more upon the ground of his leanings as to the site, rather than of his general ability. That is an eventuality which the Commissioners must beware of. Perhaps it would be better, were it possible, to drop the subject of the removal of the works in the meantime, and take it up next summer, when the new man will have had some acquaintance with his work.

The Dundee Town Council are to be recommended by their Finance Committee to promote a Bill in the next session of Parliament, giving them enlarged borrowing powers for their gas and electric lighting undertakings, and for regulating other matters, including the extension of the electric light installation. The necessity for further borrowing powers is pressing. At present, the statutory power they possess is limited to £200,000; but they have exceeded this sum, in indebtedness to the bank and otherwise, by about £6000.

It will be almost matter for regret with many to learn that the tall chimney at the Edinburgh Corporation Gas-Works has been condemned, and will soon be demolished. The chimney was a feature of the Edinburgh landscape. But it was greatly objected to by people of an æsthetic taste; and its removal will be hailed by them with delight. Perhaps it may be right to explain that the great height of the chimney was not owing to any whim on the part of the Edinburgh Gas Company, but that it was forced upon them. The gas-works are situated in a deep hollow, between the Calton Hill and the ridge upon which the Old Town is built. In the early days of gas making, great quantities of very obnoxious vapours were sent up the chimney; and the result was that, so long as there was only a stalk of moderate height at the works, the fumes got into the houses on the high grounds adjoining. The residents on the slope of the Calton Hill, being of a superior class, specially objected to the annoyance they were subjected to. Not only were the fumes of disagreeable smell, but it was found to be impossible to keep silver in the houses clean. The Gas Company therefore, in 1846, built the tall chimney, which had the effect of carrying the products of combustion away from everything terrestrial; and the complaints thereupon ceased. The chimney has done duty since, till this year, when it began to give way, from some cause which is still a mystery. The foundation is stiff blue clay, which is hemmed in at the north and south sides by igneous rocks. The clay is, somewhat strangely, water yielding; suggesting the presence in it of fissures or pockets containing water. It is pierced in numerous places by very deep wells, which are used for brewery purposes. For more than a year, the North British Railway Company have been engaged in driving a tunnel through the rock of the Calton Hill, about 100 yards from the chimney. In their work, they employ a very powerful blasting material, the shots of which, I have been told by a gentleman whose business place is in the neighbourhood, produced vibration sufficient to almost shake him off his chair. One of the theories for the giving-way of the foundation of the chimney, is that the violent shocks from the blasting operations in the tunnel may have rent the rock, and led to the draining away of the water in one of the fissures in the clay on the east side of the chimney, thereby lessening the amount of support it received on that side. Though this is, to my mind, the most feasible suggestion, it will probably never be known. I daresay it might have been possible to have righted the chimney, though it was some 5 or 6 feet off the plumb; but the masonry of it is showing signs of giving way, and the Commissioners have wisely resolved to take it down.

The question arises as to what is to be put in its place. The Gas Commissioners propose to erect a chimney 250 feet high, having altered the height from 160 feet as mentioned last week. It was then stated that the Dean of Guild Court urged that the new chimney should be erected rather to the south than to the east of the present one. At this week's sitting of the Court, Mr. Masterton, the Assistant Manager in the gas-works, on behalf of the Commissioners, presented a plan showing that the Commissioners had to a considerable extent acceded to the wish of the Court. The Commissioners had the assistance, in considering the matter, of Mr. C. Dennis, of Bury, who is probably the greatest authority in this country upon the construction of flues and chimneys. Anything, therefore, which they may have resolved to do, will be regarded as safe and reasonable. On considering the matter, it does look as if, other things being equal, it would be advisable to get away as far as possible from the east side of the present chimney, where the weakness exists. This has now been done; and the Dean of Guild expressed the opinion that the site was a good deal better than the first one proposed. The idea is to get the chimney as near as possible to the high houses in the Canongate, so as to remove it from the centre of the valley, and to a large extent to conceal it among other buildings. That is quite as it should be, provided the chimney can be made serviceable, which is the first consideration. But the Court went further, and suggested that the Commissioners should give the new chimney something of an architectural character. They thought, also, that 200 feet should be high enough. Mr. Masterton said the intention of the Commissioners was at first to erect two chimneys of 160 feet each; but that the one they had now agreed upon would have to do all the work. He was afraid that a chimney of 200 feet would scarcely have sufficient draught. The Court granted a warrant to proceed with the foundation of the new chimney, and to erect it to a height of between 20 and 30 feet; but they continued the questions of height and appearance for the further consideration of the Commissioners. Now it is quite true that, in a city such as Edinburgh, it is particularly desirable to have everything as good looking as possible; and it is also true that, so far as proportion is concerned, it will cost no more to erect a chimney of artistic design than to build an ugly thing. But I should say that, if an attempt be made to coerce the Commissioners into erecting a costly structure, they ought to resent it. In the present condition of the Edinburgh Gas-Works, and taking into account the rapid growth of the gas consumption, it is evident that before very many years the present site of the works will require to be abandoned, and a new one, giving more room, will have to be found. A chimney of moderate cost would therefore be the most desirable. It would be advisable from the Commissioners' point of view; but it might also be an advantage in the æsthetic sense, because, were the Commissioners encouraged to seek for a new site, the citizens might look forward to the whole works being cleared away in a few years.

The Falkirk Gas Commissioners have narrowly escaped having another litigation on their hands. A claim for £144 15s. was made by Messrs. Scrimgeour, of London, for services rendered in connection with the Corporation Gas Bill. The Messrs. Scrimgeour raised a summons against the Corporation for the amount. On Monday night, the Gas Commissioners considered the subject; and by 5 votes to 4, they resolved to settle the claim outside the Court—the losing motion being that they should defend the action. The Commissioners are under negotiation for the construction of a railway siding into the gas-works. At present, their carting account is about £500 a year; and they expect to be able to reduce this sum. The railway would require to pass through ground belonging to the Falkirk Iron Company; but the Company, it is stated, are willing to consider favourably any proposal by the Gas Commissioners as to the passing of a railway through their property.

In connection with the working of the Inverness Corporation Gas-Works, there was last year a profit of £1788. At the end of the preceding year, the balance of profit amounted to £2802; and there is now a credit balance on hand of £4591. Last year the Corporation reduced the price of gas from 5s. 4d. to 4s. 7d. per 1000 cubic feet; and they now propose to reduce it to 4s. 2d., which will make the very gratifying reduction of 1s. 2d. per 1000 cubic feet within little more than a year. The Finance Committee, adopting a suggestion by the Manager (Mr. J. Thomson), have agreed to recommend that £1350 should be expended out of revenue on a retort-bench; being one-half of the cost, the other half to be charged to capital, to cover the portion which is an extension.

With regard to the erection of a new gasholder by the Gourock Gas Commissioners, a bed of whinstone rock was found 14 feet from the surface of the ground. The Commissioners resolved to stop the excavation of the tank at that level, instead of proceeding to the originally intended depth of 20 feet. On Wednesday night, however, they reconsidered the matter; and, on account of the view that the holder would sit too high if the tank only went down 14 feet, they resolved to go down the full depth of 20 feet. The extra outlay will be about

£400, and will bring up the cost of the holder to about £3600. The holder is the one which Sheriff Cheyne, in April last, granted the Commissioners permission to erect without obtaining the sanction of adjoining owners and occupiers of houses.

The Largs Police Commissioners on Monday night considered the subject of the adoption of the Burghs Gas Supply (Scotland) Act, 1876. Two gentlemen opposed the proposal on the ground that three years had not elapsed since they had the subject before them. The proposal to adopt was, however, carried by 3 votes to 2.

A special meeting of the Cupar Gas Company has been called, to consider whether the Company should not be converted into a limited liability one, and be registered as such.

The Town Council of Aberdeen had a long discussion last Monday week on a proposal by the Streets and Roads Committee to lay a number of the secondary thoroughfares in the city with a pavement made of macadam and tar. Before making the proposal, the Committee visited London and other towns where such paving has been used; and they returned satisfied that it would be an advantage to the city to try it. The first cost was certainly less than for other forms of improved paving. The only question was as to durability; and on that point, though the data are not very authoritative, the Committee resolved to risk the experiment. Now, had it been in any other place than Aberdeen, the proposal would most probably have been at once adopted. In Aberdeen, however, there is a large production of the granite paving-stones which were the most approved form of paving not so many years ago. There is still a large demand for these stones; and the representatives of the working population, fearing that, if Aberdeen were to show the way in Scotland in the matter of superseding granite paving, the movement might lead to the loss of work in the district, sent a deputation to the Town Council who spoke against it. Some of the Councillors took the same view; and the proposal was defeated by 14 votes to 9. The policy is quite natural; but it is short-sighted, as are all movements for the restriction of public improvements. The great noise of traffic over granite pavements makes them undesirable, and as soon as a satisfactory substitute is found, their day will be gone. A better movement in Aberdeen would, therefore, have been, seeing that they have already a very large connection in the paving industry, to have sought to improve it rather than to cripple their future. Of course, the successful party are the party of the labour interest, which is very seldom well advised. The interest in the question to your readers lies in the fact that an extended use of tar for paving purposes would very largely assist their revenue.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *Sept.* 28.

Sulphate of Ammonia.—Throughout the week, supplies have been adequate, although there has been a fair demand (largely, it may be observed, from second hands to cover sales); and prices have been fairly maintained. The closing quotations were £8 15s. per ton f.o.b. Leith; £8 16s. 3d. f.o.b. Hull; and £9 f.o.b. Liverpool. For forward delivery, speculators are offering at a very moderate premium upon spot values; but these offers do not seem to be attracting much business, notwithstanding that sulphate of ammonia is relatively so much cheaper than nitrate of soda and other high-class nitrogenous material.

Nitrate of Soda is very quiet. Spot value of fine quality is 7s. 10½d. per cwt.; and cargoes of ordinary quality, autumn shipment, are worth about the same. The efforts to effect a combination for the curtailment of the output have so far been unsuccessful.

LONDON, *Sept.* 28.

Tar Products.—Pitch maintains its position; and, judging from the repeated inquiries, it looks as if at any rate this season will not see lower prices. Benzols are a fraction higher in price; and as stocks in this country are now said to be *nil*, it is not unlikely that a further improvement may take place. The demand for creosote is dull; and prices continue low. Carbolic acid is moving off at old rates; while anthracene is easy all round. Business has been done during the week at the following prices: Tar, 18s. 6d. to 22s. Pitch, west coast, 35s.; east coast, 37s. 6d. Benzols, 90's, 1s. 0½d.; 50's, 1s. Solvent naphtha, 1s. 1d. Toluol, 1s. 1½d. Crude, 30 per cent., naphtha, 4¾d. Liquid creosote, 1¼d. Naphthalene salts, 25s. Cresylic acid, white, 1s. 2d.; brown, 10½d. Carbolic acid, 60's, 1s. 7d.; 75's, 1s. 9½d. Anthracene, "A," 1s.; "B," 9½d.

Sulphate of Ammonia is distinctly in better request. Considerable business is reported, but at very low prices—ranging from £8 12s. 6d. to £8 17s. 6d., less 3½ per cent., according to port of shipment and delivery conditions. Gas liquor is quoted at 6s. to 7s.

Gas Storage Extension at Woodbridge.—Messrs. Clayton, Son, and Co., of Leeds, have just completed the work of enlarging the gas-holder of the Woodbridge Gas Company. A new lift, columns, and other necessary requirements have been provided, which will enable the Company to supply at least ten hours' extra consumption of gas in case of emergency. In commemoration of the event, the employees of the Company have been entertained by the Directors to a dinner.

The Water Cutting-Off Case at Cardiff.—In reference to the case reported last week in which a Mr. Newman sued the Cardiff Corporation for illegally cutting off the supply of water to the house of which he was the tenant, it is only fair to the Corporation Water Committee to say that the supply was cut off at the instance of a rate collector named Marks, after the Town Clerk had decided that no such action could be taken, and definite instructions had been given not to do anything in the matter. Marks has since been called before the Committee, and asked for an explanation. He acknowledged his mistake; but, in extenuation, he said that he signed the requisition for cutting off the water without considering the circumstances. He expressed his extreme regret for what had happened, and said he had paid the fine and costs out of his own pocket.

COAL TRADE REPORTS.

From Our Own Correspondents.

Lancashire Coal Trade.—No material change can be reported as regards the coal trade of this district. Business continues extremely slow, with no improvement in prices; whilst, with pits in most cases working only three to four days per week, supplies are ample. House coals, here and there, are meeting with a somewhat better sale; but generally there is neither that increased demand for winter requirements which usually comes forward, nor the advance in prices which is generally put in force with the close of the summer season. The exceptionally hot weather, of course, tends to diminish the demand for house-fire qualities. Steam and forge coals are a continued drug upon the market, the increased demand for iron-making purposes not being sufficient to make itself felt upon the large supplies offering; and prices are cut excessively low. Engine fuel is more plentiful, if anything; and there is no difficulty in meeting requirements, with prices about as last given. At the pit mouth, best Wigan Arley averages 10s. to 10s. 6d. per ton; Pemberton four-feet and seconds Arley, 8s. 6d. to 9s.; common house coals, 7s. to 7s. 6d.; steam and forge coals, 6s. to 6s. 6d.; and engine fuel, 3s. to 3s. 6d. for common slack, and 4s. 6d. to 5s. for better qualities. For shipment, only a slow inquiry is reported to be coming forward, with prices as low as ever; 7s. to 7s. 3d. per ton representing the average figures for steam coal, delivered at the ports on the Mersey.

Northern Coal Trade.—The course of the coal trade in the North has been affected, on the one hand, by the desire to export coals before the closing of the northern ports of the Baltic, and, on the other, by the very hot weather limiting the consumption of household coals. Best Northumbrian steam coals have been in fair demand, and have commanded about 8s. 9d. per ton f.o.b.; whilst second qualities have been generally quoted at from 8s. to 8s. 3d., and steam small coals at 3s. 6d.—the latter kind being rather scarce. Manufacturing coals are very quiet; but there is a little desire to contract forward, as some consumers seem to believe that the price may be dearer next year. In regard to gas coals, there has been a partial settlement of the contract for Newcastle. It is the largest in the North; about 200,000 tons being carbonized yearly. Contracts have already been entered into for more than a third of this quantity, at about 6s. 6d. per ton f.o.b. A large tonnage has been offered at higher prices; and counter negotiations are being entered into, so that probably the bulk of the coal will be bought at rates that are not much above that just named. This will represent a considerable saving on the coal from the price that is being paid for this year's supply. Generally, the gas coal trade is steady; and the deliveries are being largely increased, as is usual when October is at hand. There is very little alteration this week in the coke trade; the improvement of the past few weeks being still maintained. For export, the price of coke is 14s. per ton f.o.b.; while for local use the quotation is about 13s. per ton, delivered at local furnaces. Gas coke is steady in price; but there are large stocks at most of the inland gas-works, and the production is now beginning to increase, so that in some cases lower offers are being made when the demand is for a considerable quantity.

Scotch Coal Trade.—Inactivity characterizes the coal market in Scotland just now. It is recognized that contracts which were lost last year might be recovered if quotations a little lower were tendered; but coalowners feel that they have already gone low enough, and they are unwilling to go further. In the east of Scotland, trade is exceedingly slow. In the west, where there is a better demand, the men are for the most part working only four and a half days a week. Prices for all varieties remain much about the same, and are given as: Main, 5s. 9d. per ton f.o.b. Glasgow; ell, 6s. 9d. to 7s.; splint, 6s. 3d. to 6s. 6d.; and steam, 7s. 6d. to 7s. 9d. The shipments for the week amounted to 168,665 tons—an increase as compared with the quantity in the preceding week of 23,889 tons, and upon the quantity in the corresponding week of last year of 159,020 tons. For the year to date, the total shipments have amounted to 5,286,969 tons—an increase as compared with the same period of last year of 1,510,810 tons, but a decrease on the same period of 1893 of 89,836 tons.

Gloucester Water Supply.—At last Tuesday's meeting of the Gloucester City Council, the Surveyor was empowered to arrange, if necessary, for supplementing the city water supply from the Severn; the supply at the Witcomb water-works having been reduced by deficiency of rain to less than two months. It was stated that the new works at Newent were being pushed on with all possible despatch; and it was hoped they would be available by the end of 1896.

Northam Water Supply.—In consequence of grave difficulty in respect to water supply, the Northam District Council at a recent meeting instructed Mr. Baldwin Latham, C.E., to investigate possible sources, and prepare a scheme which would serve the whole district. The population was upwards of 5000 in 1891; and the district includes Westward Ho and Appledore, and is very variable in regard to elevation. Mr. Latham pointed out that it would be quite easy to obtain a gravitation supply for Westward Ho, Orchard Hill, and Appledore, but difficult to supply the higher part of Northam by this means. Of five sites which he had marked as collecting areas, one south of Redford Farm, Abbotsham, would be most suitable. It had an area of 120 acres, and had neither habitations nor mill rights. An impounding reservoir there would be sufficiently high to supply all but part of Northam. In order to make economical water-works, an intermediate distributing reservoir would be required; and at the point where this was made, he proposes to put down a small pumping plant to send water to a high-level reservoir to serve the more elevated parts. He suggested that an Act of Parliament should be obtained, as by this means the term of repayment of the loan would be longer than under a Provisional Order; and he said that, if there was no opposition, the cost of an Act would be no greater than that of an Order. In the course of the discussion, Mr. Latham was asked if the cost would be £20,000; and he replied that he did not think it would. It was decided that Mr. Latham should supply plans and estimates for his scheme.

The Nidd Water-Works of the Bradford Corporation.—The Water Committee of the Bradford Corporation last Friday decided to recommend the Town Council to accept the tender of Mr. Phineas Drake, for the construction of a new storage reservoir and filter-beds at Chellow Dean, in connection with the Nidd Valley water-works. The amount of the tender was £59,950; and the reservoir will have a capacity of 32 million gallons.

Extensions at the Selby Gas-Works.—The gas-works of the Selby Urban District Council have lately been extended, to the designs and under the supervision of the Engineer and Manager (Mr. Matt. Dunn, Assoc.M.Inst.Mech.E.), by the construction of three beds of oval retorts, the enlargement of the retort and engine houses, the fixing of annular condensers, and a new engine and exhauster, the erection of meter and gas testing houses and plant, &c. The summer production of gas this year shows an increase of 37 per cent. over 1894, and of more than 50 per cent. over 1892. These improvements will amply provide for dealing with the increased production and output of gas. The eight-hour system has been adopted by the Council for stokers and wheelers.

The Construction of the New Water-Works at Plymouth.—The Plymouth Water Committee have arrived at an important resolution. Two years ago, they obtained parliamentary sanction to extensive works, including the construction of a large storage reservoir, and the laying of a pipe-line to supersede, or supplement, the conveyance of water to the service reservoir by means of the historic Leat. After lengthy deliberation, it was decided that the Corporation should themselves lay the pipe-line and undertake the preliminary work of excavating the sites of the masonry dams for the reservoir. So far as this work has gone, it is claimed that the Corporation have saved money by doing it instead of employing a contractor. The Committee have now resolved that the remainder of the works, which are the more important and costly, shall be executed by the Corporation and not by contract. They propose to employ a firm of surveyors to take out the quantities of the works in relation to the Burrator reservoir, and to pay them a commission of ¾ per cent. on the value of the works; the commission to include the cost of lithographing and all out-of-pocket expenses. A difficulty has apparently arisen in defining, under the circumstances, the value on which the commission is to be paid; for the resolution says "such value to be arrived at in a manner to be hereafter determined by the Corporation." The works have been and will be carried out under the supervison of Mr. James Mansergh, the Consulting Engineer, and Mr. E. Sandeman, the Corporation Water Engineer.

The Glamorgan County Council and the Water-Supply Proposals of the London County Council.—During the proceedings of the Glamorgan County Council at Pontypridd last Thursday week, the Chairman (Mr. J. B. Jenkins) reported that the Water Committee had directed the Clerk to inquire of the District Councils what their provision for water supply was, having regard to future probable increase of population, and possible diminution of sources of supply, and to ask them whether they would be disposed to be included in a joint scheme with other districts for securing a proper and sufficient supply. Mr. T. J. Hughes declared that he was greatly disappointed they had not done more than was indicated in the report; for the position was now infinitely more serious than it was three months ago. At that time they contemplated the possibility of further inroads being made into their valuable sources of water supply; now they saw that this possibility had become a strong probability. The London County Council had formulated a water scheme; and the special report of their Engineer showed that it was proposed to adapt for the use of London five existing sources of water supply in Wales, the total anticipated yield from which was estimated at 415 million gallons per day, or a greater body of water than passed over the Thames at Teddington Weir every day. Moreover, each of these sources was above 600 feet high. The water supply for the populous part of the county of Glamorgan had necessarily to be of very high altitude; and their present sources ranged from 600 to 2800 feet. Another very important factor was that these five sources came from those districts which they in Glamorgan were told, when they were opposing the Birmingham scheme, ought to be available for them. He thought the matter to be of such importance that he moved—"That the Water Committee be asked to hold a special meeting; that the Committee be empowered to take such steps and incur such expense as the urgency of the situation might demand; and that it be an instruction to the Committee to invite the co-operation of such county councils and other public bodies in South Wales as are specially interested." The report and resolution were adopted. A few members of the Water Committee afterwards met; and it is understood they decided to hold a special meeting at an early date.

Proposed Water-Works for Crowborough.—A company is being formed at Crowborough, Sussex, for the promotion of a scheme for the establishment of local water-works; and Lord Cantelupe has given permission for the necessary land on Crowborough Common to be utilized for the construction of a reservoir, without making any restriction whatever.

Exhibition of Gas Appliances.—By arrangement with the Stoke-on-Trent Corporation Gas Committee, Messrs. John Wright and Co. have lately been exhibiting, in the Town Hall, a large collection of their gas stoves and appliances. In connection therewith, Miss Beatrice Shaw, of the Nottingham School of Cookery, conducted some demonstrations in cooking by gas, which attracted good audiences.

GAS AND WATER COMPANIES' STOCK AND SHARE LIST.

(For Stock Market Intelligence, see ante, p. 672.)

Issue.	Share	When ex-Dividend.	Dividend or Div. & Bonus.	NAME.	Paid per Share	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.	GAS COMPANIES.				£ s. d.
590,000	10	10 Apl.	10½	Alliance & Dublin 10 p. c.	10	24–25	+½	4 4 0
100,000	10	"	7½	Do. 7 p. c.	10	16–17	..	4 8 3
300,000	100	1 July	5	Australian (Sydney) 5 % Deb.	100	107–109	..	4 11 9
200,000	5	1 May	6½	Bombay, Limited	5	7¼–7¾	..	4 3 10
40,000	5	"	6½	Do. New	4	5¾–5¾	..	4 10 3
380,000	Stck.	14 Aug.	12	Brentford Consolidated	100	253–258	..	4 13 0
180,000	"	"	9	Do. New	100	200–210	..	4 5 8
220,000	Stck.	27 Sept.	11	Brighton & Hove Original	100	222–227*	..	4 16 10
933,500	Stck.	29 Aug.	5	Bristol	100	125–130	..	3 16 11
320,000	20	27 Sept.	11½	British	20	54–55*	..	4 1 10
50,000	10	29 Aug.	11½	Bromley, Ordinary 10 p. c.	10	21½–22½	..	5 2 2
51,510	10	"	8½	Do. 7 p. c.	10	16½–17½	..	4 17 1
328,750	10	12 June	4	Buenos Ayres (New) Limited	10	8–8½	..	4 14 1
200,000	100	1 July	6	Do. 6 p. c. Deb.	100	101–104	..	5 15 5
150,000	20	11 July	8½	Cagliari, Limited	20	31–33	..	5 0 0
550,000	Stck.	10 Apl.	13½	Commercial, Old Stock	100	305–310	+5	4 7 1
165,000	"	"	10½	Do. New do.	100	225–230	..	4 11 4
160,762	"	12 June	4½	Do. 4½ p. c. Deb. do.	100	143–147	..	3 1 3
800,000	Stck.	12 June	13	Continental Union, Limited.	100	270–280	..	4 12 10
200,000	"	"	10	Do. 7 p. c. Pref.	100	207–212	..	4 14 4
535,000	Stck.	29 Aug.	5½	Crystal Palace Ord. 5 p. c. Stk	100	125–130	..	4 0 9
486,090	10	26 July	11	European, Limited	10	25–26	..	4 4 7
354,060	10	"	11	Do. Partly paid	7½	17–18	..	4 14 3
5,646,590	Stck.	14 Aug.	12¾	Gaslight & Coke, A, Ordinary	100*	293–297	−1½	4 5 10
100,000	"	"	4	Do. B, 4 p. c. max.	100	107–112	..	3 11 5
665,000	"	"	10	Do. C, D, & E, 10 p.c. Pf.	100	282–287	+2	3 9 8
30,000	"	"	5	Do. F, 5 p. c. Prf.	100	135–140	+5	3 11 5
60,000	"	"	7½	Do. G, 7½ p. c. do.	100	200–205	+3	3 13 2
1,300,000	"	"	7	Do. H, 7 p. c. max.	100	193–198	+1	3 10 9
463,000	"	"	10	Do. J, 10 p. c. Prf.	100	280–285	+3	3 10 2
476,000	"	"	6	Do. K, 6 p. c. Prf.,	100	167–170	+3	3 10 7
1,061,150	"	12 June	4	Do. 4 p. c. Deb. Stk.	100	135–140	..	2 17 2
294,850	"	"	4½	Do. 4½ p. c. do.	100	145–150	..	3 0 0
908,000	"	"	6	Do. 6 p. c. do.	100	202–207	..	2 17 11
3,800,000	Stck.	10 May	12	Imperial Continental	100	249–254	..	4 14 5
75,000	5	26 June	6	Malta & Mediterranean, Ltd.	5	5¼–6¼	..	4 16 0
560,000	100	1 Apl.	5	Met. of Melbourne, 5 p.c. Deb.	100	115–117	..	4 5 6
541,920	20	12 June	5	Monte Video, Limited	20	18–19	+½	5 5 3
150,000	5	21 May	8	Oriental, Limited	5	7¼–7¾	..	5 3 2
60,000	5	12 Sept.	7	Ottoman, Limited	5	5–5¼	..	6 7 3
166,870	10	14 Feb.	2	Para, Limited	10	1½–2½	..	8 0 0
				People's Gas of Chicago—				
420,000	100	2 May	6	1st Mtg. Bds.	100	105–110	+1½	5 9 1
500,000	100	4 June	6	2nd Do.	100	100–105	..	5 14 3
150,000	10	26 Apl.	7	San Paulo, Limited	10	10½–11¾	..	6 1 9
500,000	Stck.	29 Aug.	15½	South Metropolitan, A Stock	100	370–375	..	4 2 8
1,350,000	"	"	12	Do. B do.	100	307–312	..	3 16 11
308,685	"	"	13	Do. C do.	100	320–325	..	4 0 0
800,000	"	11 July	5	Do. 5 p. c. Deb. Stk.	100	174–177	..	2 16 6
60,000	Stck.	12 Sept.	11½	Tottenham & Edm'nton, "A"	100	230–235	..	4 17 10
				WATER COMPANIES.				
746,021	Stck.	26 June	10	Chelsea, Ordinary	100	292–297	+2	3 7 4
1,719,514	Stck.	10 Apl.	7†	East London, Ordinary	100	223–228	..	3 1 5
654,740	"	26 June	4½	Do. 4½ p. c. Deb. Stk.	100	157–162	..	2 15 6
700,000	50	26 June	7	Grand Junction	50	117–122	..	2 17 5
708,000	Stck.	29 Aug.	12	Kent	100	303–308	..	3 17 11
1,043,800	100	26 June	7½	Lambeth, 10 p. c. max.	100	259–264	+1	2 16 9
406,200	100	"	7½	Do. 7½ p. c. max.	100	208–213	..	3 10 5
330,000	Stck.	27 Sept.	4	Do. 4 p. c. Deb. Stk.	100	143–148*	..	2 13 4
500,000	100	14 Aug.	12½	New River, New Shares	100	385–395	..	3 2 9
1,000,000	Stck.	26 July	4	Do. 4 p. c. Deb. Stk.	100	143–145	..	2 14 2
902,300	Stck.	12 June	4	S'thwk & V'xhall, 10 p.c. max.	100	147–152	..	2 12 7
126,500	100	"	4	Do. D 7½ p.c. do.	100	140–145	..	2 15 2
1,155,066	Stck.	12 June	10	West Middlesex	100	290–295	..	3 7 10

*Ex div

† Next dividend will be at this rate.

GAS PURIFICATION AND CHEMICAL COMPANY, LIMITED.

OXIDE OF IRON.

O'NEILL'S Oxide has a larger annual sale in the United Kingdom than all other Oxides combined. Purity and uniformity of quality guaranteed. Pamphlet, "How to Purchase Bog Ore," to be obtained on application.

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ANDREW STEPHENSON, AGENT. All communications re Oxide to be addressed to Palmerston Buildings.

WINKELMANN'S "VOLCANIC" CEMENT. Fire Resistance up to 4500° Fahr. In use in most Continental Gas-Works, and in more than 300 British Gas-Works

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Telegrams: "Volcanism, London."

W. C. HOLMES & CO., Huddersfield; AND 80, CANNON STREET, LONDON, Contractors for Gas-Works complete, Makers of Gasholders, Purifiers, Scrubbers, Condensers, Retort Fittings, &c., Improved Valves, Engines, and Exhausters. Also Improved Patent Rotary Scrubber-Washers.

*** See Advertisement p. 662 of this week's issue.

Cablegrams: "Ignitor London." Telegrams: "Holmes Huddersfield."

J. & J. BRADDOCK, Globe Meter Works, Oldham.

First-Class Award, Melbourne Exhibition, 1889, for WET AND DRY GAS-METERS, STATION METERS, AND GOVERNORS, PRESSURE-GAUGES, STREET LAMPS AND PILLARS, &c.

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JOHN NICHOLSON & SONS, Limited, Chemical Works, Leeds, specially produce this ACID from BRIMSTONE, for making SULPHATE OF AMMONIA of high quality and *good* colour. Delivery in our own Railway Tank-Wagons or Carboys. Highest references and all particulars supplied on application.

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BALE & CO.'S Oxide of uniform quality. Sample and Price on application.

OXIDE PAINTS, OILS, SULPHURIC ACID, &c. 120 and 121, NEWGATE STREET, LONDON, E.C. Telegrams: "BOGORE, LONDON."

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FINEST Quality of Natural Bog Ore. Particulars and price, apply to Mr. T. L. ARCHER, 20, Fennel Street, MANCHESTER.

PORTER & CO., Gowts Bridge Works, LINCOLN, Engineers, Ironfounders, and Contractors for the erection of Gas-Works for, Towns, Villages, Mansions, Manufactories, Collieries, and Isolated Buildings, at home and abroad. Manufacturers of Retorts and Fittings, Condensers, Scrubbers, Purifiers, Valves, &c.; also of Girders, Wrought and Cast Iron Tanks, Iron Roofs, &c.

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PATENT GAS EXHAUSTERS AND ENGINES.

Telegrams: "GWYNNEGRAM, LONDON." Telephone No. 2698.

GWYNNE & CO.,

HYDRAULIC AND GAS ENGINEERS,

BROOKE STREET WORKS, HOLBORN, LONDON, E.C.

Late ESSEX STREET WORKS, VICTORIA EMBANKMENT, LONDON.

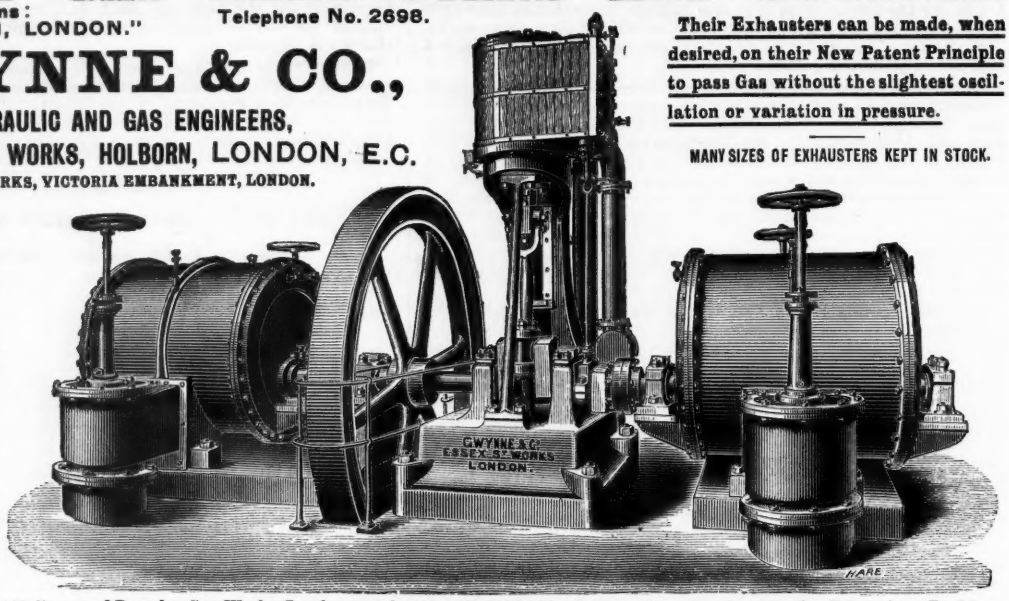
They have completed Exhausters to the extent of 32,000,000 cubic feet passed per hour, which are giving unqualified satisfaction in work.

Makers of GAS-VALVES, HYDRAULIC REGULATORS, VACUUM GOVERNORS, PATENT RETORT-LIDS, STEAM-PUMPS for Tar, Liquor, or Water; CENTRIFUGAL PUMPS and PUMPING ENGINES, specially adapted for Water-Works, raising Sewage, &c.

Also GIRARD and other TURBINES, HIGH SPEED ENGINES, DYNAMOS, &c., &c., for ELECTRIC LIGHTING.

Their Exhausters can be made, when desired, on their New Patent Principle to pass Gas without the slightest oscillation or variation in pressure.

MANY SIZES OF EXHAUSTERS KEPT IN STOCK.



Exhausting Machinery at Fulham and Bromley Gas-Works, London—each set passing 400,000 cub. ft. per hour drawing 14 miles distant from Beckton.

Catalogues and Testimonials sent on application.

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Orders for Alterations in, or Stoppages of PERMANENT ADVERTISEMENTS, should be received not later than the FIRST POST on SATURDAY.

AMMONIACAL LIQUOR Wanted.
BROTHERTON AND CO., Ammonia Distillers. Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

GAS TAR Wanted.
BROTHERTON AND CO., Tar Distillers. Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

SPENT OXIDE Wanted.
BROTHERTON AND CO., Chemical Manufacturers. Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

BROTHERTON & CO.
Offices: Commercial Buildings, LEEDS. Correspondence invited.

JOHN RILEY & SONS, Chemical Manufacturers, Hapton, near Accrington, are MAKERS of SULPHURIC ACID, from Brimstone, for Sulphate of Ammonia making. Highest percentage of Sulphate of Ammonia obtained from the use of this Vitriol. References given to Gas Companies.

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ROBERT BRUCE FITZMAURICE, 29, Great St. Helens, London, Shipping Agent to several Gas Companies and Plant Manufacturers, would be glad to UNDERTAKE LARGE or SMALL SHIPMENTS to any Port.

HYDRATED OXIDE OF IRON.

PREPARED from pure Iron.
Two or three times as rich as Bog Ore.
Strong action on Sulphuretted Hydrogen.
To be used alone, but will increase activity of other Oxides.
Less than half the price of Bog Ore.
Can be lent on hire.
Write for tabulated results.
READ HOLLIDAY AND SONS, LIMITED, HUDDERSFIELD.

THE Appointment advertised under No. 2553, care of Mr. King, has been made; and the Advertisers thank those who made application for the same.

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Projectors of new Carburettors, Retorts, Incandescent Lighting Apparatus, and other Novelties in Gas Plant and Gas Lighting are invited to correspond with No. 2572, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

SPECIAL PAINT FOR GAS-WORKS.
JOHN E. WILLIAMS AND CO.,
VICTORIA PAINT WORKS, MANCHESTER.
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GAS PLANT CEMENT.
JOHN E. WILLIAMS AND CO.,
VICTORIA PAINT WORKS, MANCHESTER.
For all Joints in connection with Oil-Gas Plant and Sulphate Plant.
For all Gas Joints.
For all Tar Joints.
For all Ammonia Joints.

SULPHATE OF AMMONIA SATURATORS.
WALTER THOMASON and SONS, Chemical Plumbers, &c., and Makers of Lead Saturators, &c., 21, WESTON STREET, BOLTON. Repairs of every description.
Please write for Estimate before ordering elsewhere.

SADLER AND CO., LIMITED, MIDDLESBROUGH; ULVERSTON (BARROW); PORTSMOUTH; CARLTON; STOCKTON; 315, St. Vincent Street, GLASGOW; and 85, Water Street, NEW YORK. Tar Distillers, Manufacturers of all TAR PRODUCTS, ALIZARINE and other TAR COLOURS, BICHROMES, OXALIC ACID, ALKALIES, LIQUOR AMMONIA, AMMONIA SULPHATE, &c.
Head Office MIDDLESBROUGH. Correspondence invited.

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J. C. CHAPMAN, M.I.M.E. and Fel. Chartered Inst. Patent Agents. ADVICE ON ALL MATTERS CONNECTED WITH ABOVE.
Information and Handbook on application.
70, CHANCERY LANE, LONDON, W.C.

BACK-PRESSURE IN PURIFIERS.
THE Valve invented by Mr. Cripps for Bye-Passing any Layer of Purifying Material referred to by the President of the Incorporated Institution of Gas Engineers in his Inaugural Address) can be obtained of the Makers: C. & W. WALKER, Midland Iron-Works, Donnington, near Newport, SALOP, and J. EVERY & SON, Phœnix Iron-Works, LEWES, to which Firms all inquiries should be addressed.

WANTED, immediately, a Stoker for Day and Night Shifts. Wages, 22s.
Apply to F. B. JENNINGS, FELIXSTOWE.

WANTED, by the Kingston-upon-Hull Gaslight Company, a RENTAL CLERK and COLLECTOR of GAS-RENTS and other ACCOUNTS. Persons who have been already employed in similar work only need apply.
Security for faithful services will be required.
Salary, £110 per annum.
Applications, with *copies* of not more than three recent Testimonials, to be addressed to the Chairman, Gas Office, Broadley Street, Hull, on or before the 7th day of October next.
Sept. 24, 1895.

SULPHATE OF AMMONIA SATURATORS.
JOSEPH TAYLOR & CO., Chemical Plumbers, &c., and Makers of every description of Solid Plate Lead and Timber Cased Saturators, &c. CENTRAL PLUMBING WORKS, TOWN HALL SQUARE, BOLTON. Special Attention to Repairs.
Before placing Orders, please write for Estimate.

THE Undersigned is in a position to supply, at the very lowest Prices, the most suitable kind of BENZOL for enriching Gas, made from Hardman's Patent Carbonization Process, of which I am the Sole Patentee. On application, I would furnish Price on the most reasonable terms; giving advice how to utilize it on the most economical method.
J. HARDMAN, Manufacturing Chemist.
Milton, Staffs.

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Also DRAWINGS, TRACINGS, &c., of COAL GAS PLANT; Specially prepared for work wanted in a hurry. Moderate Charges.
Temporary Offices: 27, FORE STREET, E.C.

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WORKS Manager wanted, with thorough knowledge of the whole Details of Manufacture. An exceptional opportunity for a first-class man.
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Full Particulars, with Forms of Tender, may be obtained from Mr. Dickinson, Gas and Water Manager.
Sealed tenders, endorsed "Meters," to be lodged with the undersigned on or before Oct. 7, 1895.
By order,
STEPHEN HOLT,
Clerk to the Council.
Offices: Cross Street, Hindley,
Sept. 18, 1895.

TO TAR DISTILLERS AND OTHERS.
THE Directors of the Romford Gas and Coke Company, Limited, are prepared to receive TENDERS for the surplus TAR produced at their Works for One, Two, or Three Years, commencing the 1st of October.
The Tar will be delivered into the Contractor's Tank-Vans, or Tank-Trucks on the Siding in connection with the Great Eastern Railway.
Offers to be at per Gallon.
Sealed tenders, endorsed "Tender for Tar," addressed to the Chairman, to be sent in not later than the 12th of October, by Twelve o'clock noon.
The Directors do not bind themselves to accept the highest or any tender.
By order,
HY. JOHNSON,
Secretary.
Romford, Sept. 28, 1895.

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By William Joseph Dibdin, F.I.C., F.C.S.

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LOG MOUNTAIN COAL, COKE, AND TIMBER CO.,
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Cable Address: "Hull, Pineville."

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OXIDE OF IRON.

JAMES HUNTER, MINER, AND SHIPPER OF
NATURAL IRISH BOG ORE.

This Estate yields the finest and most uniform quality in Ireland; and the quality is guaranteed.

Samples and Prices on application.

5, PRINCES STREET, PORT GLASGOW.
Telegrams: "HUNTER, PORT GLASGOW."
Established 1872.

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The Incandescent Gas-Light Company, Limited, Hereby Give Notice, that they only supply their Mantles subject to the following express Conditions, which are printed and pasted on each box:—

"The Incandescent Gas-Light Company Limited, in supplying the Mantle contained in this box, grant a Limited License to the purchaser to sell or use the same on the express condition that neither the purchaser nor any other person into whose hands the same may come shall use or sell the said Mantle except in connection, or for use, with Burners sold or supplied by the Company; any other sale or use will amount to Infringement of the Company's Patents. The Company supply Mantles for the purpose of renewals at the nominal price of 1s. 3d., subject to the Conditions and Limitations above set forth."

In the case of *The Incandescent Gas-Light Company, Limited v. Cantelo*, **Mr. Justice Wills upheld the Validity of these Conditions and Limited License; and, in the course of his Judgment, said:—**

The patentee has the sole right of using and selling the articles; and he may prevent anybody from dealing with them at all. Inasmuch as he has the right to prevent people from using them or dealing in them at all, he has the right to do the lesser thing—that is to say, to impose his own conditions. It does not matter how unreasonable or how absurd the conditions are. It does not matter what they are if he says at the time when the purchaser proposes to buy, or the person proposes to take a license: 'Mind I only give you this license on this condition;' and the purchaser is free to leave it or take it as he likes. If he takes it, he must be bound by the condition."

In the case of *The Incandescent Gas Light Company v. Hirschfeld and Others*, **the Honourable Mr. Justice Romer certified that the Validity of the Plaintiffs' Patents was established. Infringers in future will be liable to costs as between Solicitor and Client.**

(Signed) **FAITHFULL & OWEN,**
Solicitors for the Incandescent Gas-Light Company, Limited.

UNEQUALLED.

Gas Companies are solicited to try Samples of the

MIRFIELD

BLACK BED GAS COAL.

Prices and Analysis on application.

MIRFIELD (GAS-COAL) COLLIERY COMPY.
RAVENSTHORPE, NEAR DEWSBURY.

JAMES OAKES & Co.,

ALFRETON IRON-WORKS, DERBYSHIRE,
AND
Wenlock Iron Wharf, 21 & 22, Wharf Road, CITY ROAD, LONDON, N.,

Manufacture and keep in Stock at their Works (also large stock in London)

PIPES and CONNECTIONS, 1½ to 48 inches in diameter, and make and erect to order RETORTS, PURIFIERS and TANKS, with or without planed joints, COLUMNS, GIRDERS, SPECIAL CASTINGS, &c., required by Gas, Water, Railway, Telegraph, Chemical, Colliery, and other Companies.

NOTE.—Makers of HORSLEY'S PATENT SYPHONS. These are cast in one piece, without Chaplets; doing away with bolts, nuts and covers, and rendering leakage impossible.

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FOR PUMPING AIR, WATER, SEMI-FLUIDS, &c.

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Yield of Gas Per Ton . . 11,205 Cubic Feet.
Illuminating Power, 16 7/10 Stand. Sperm. Candl.
Coke (of good & pure quality) 13¾ Cwt. Per Ton.
Sulphur . . . . A little over 1 Per Cent.
Ash . . . . . Under 1 Per Cent.
Tar . . . . . 163 Lbs. (Avoir.) Per Ton.
Ammoniacal Liquor 103 Lbs. (Avoir.) Per Ton.

HOLMSIDE GAS COALS are supplied to the largest Gas Companies in England and on the European Continent; London alone consuming about half the produce.

SOUTH MOOR PELTON GAS COALS.

PRESENT DAILY PRODUCE AVAILABLE 2500 TONS.

RESULTS OF DIFFERENT ANALYSES:—

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Illuminating Power . 17 Stand. Sperm Candl.
Coke (of excellent quality) . 13½ Cwt. Per Ton.
Sulphur . . . . . 1·13 Per Cent.
Ash. . . . . 1·34 Per Cent.
Tar. . . . . 180 Lbs. (Avoir.) Per Ton.
Ammoniacal Liquor 94½ Lbs. (Avoir.) Per Ton.

The HOLMSIDE and SOUTH MOOR COALFIELD possesses *a very great quantity of the best Coal;* and, whilst other Coal-Fields are becoming exhausted, this one is only being opened out, so that *the quality* of both the HOLMSIDE COALS, and the SOUTH MOOR COALS *may be relied upon for all practical purposes.*

These Coals may be bought through the Principal Merchants in England, or direct from

MR. MARK ARCHER,
HOLMSIDE AND SOUTH MOOR OFFICES,
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HEBBURN MAIN GAS COALS.

Yield of Gas per ton . . . . . 10,500 cub. ft.
Illuminating Power . . . . . 16·4 candles.
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CANDLE SAFETY LAMPS.

Are a great improvement on Oil, giving a good Light, requiring little or no Cleaning, and when once lighted no further attention is necessary. The Candles are made to burn 5, 7, or 9 hours.

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COUNTY OF DURHAM.

Available output up to 5000 tons per day.
Yield of Gas 11,000 cubic feet per ton of Coal as per analysis by
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COMPENSATING HELICOIDAL RIBS.

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NO ALTERATION IN SETTINGS.
APPLICABLE TO ALL RETORTS.

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Inquiries from Retort Makers will be Esteemed.

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Agents Wanted.

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WORKED BY THE
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OUT OF THEIR
THORNLEY AND WHEATLEY HILL COLLIERIES.

Analysis made by
Messrs. J. & H. S. PATTINSON, *May 28, 1895,*

Yield of Gas per Ton . . 10,500 Cub. Ft.
Illuminating Power . . 16·9 Candles.
Coke (of good quality) . . 67·5 per Cent.
Sulphur . . . . . 0·58 ,,
Ash . . . . . 2·73 ,,

For Price, &c., apply to the
WEARDALE IRON & COAL Co., Ld.
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TROTTER, HAINES, & CORBETT,

Brettell's Estate

FIRE-CLAY & BRICK WORKS,

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Manufacturers of GAS-RETORTS, GLASSHOUSE FURNACE & BLAST-FURNACE BRICKS, LUMPS, TILES, and every description of FIRE-BRICKS.

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Yield of Gas per ton	13,155 cub. ft.
Illuminating Power	38·22 candles.
Coke per ton	1,301·88 lbs.

EAST PONTOP GAS COAL.

Yield of Gas per ton	10,500 cub. ft.
Illuminating Power	16·3 candles.
Coke	70 per cent.

SOUTH PELAW MAIN GAS COAL.

Yield of Gas per ton	10,500 cub. ft.
Illuminating Power	16·3 candles.
Coke	73·1 per cent.

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THOS. W. DANCE & SONS,

Coal Owners, Newcastle-on-Tyne;

or

E. FOSTER & CO.,

21, John Street Adelphi, London W.C.

BOLDON GAS COALS.

Worked by THE HARTON COAL CO., LTD.

Output about 3000 tons per day.

Analysis—

Yield of Gas per ton	10,500 Cubic Feet.
Illuminating Power	16·9 Candles.
Coke	66·7 Coke.
Sulphur	0·86 Sulphur.
Ash	2·04 Ash.

Boldon Gas Coals are supplied under contract to

The Gaslight and Coke Company, South Metropolitan Gas Company, Commercial Gas Company, Imperial Continental Gas Association, European Gas Company, L'Union des Gaz (the Continental Union Gas Company), Crystal Palace District Gas Company, Danish Gas Company, Bombay Gas Company, San Paulo Gas Company, Alliance and Dublin Consumers' Gas Company, Ipswich Gaslight Company, Newcastle Gas Company, Sunderland Gas Company, South Shields Gas Company, and to many other Companies at Home and Abroad.

For prices, &c., apply to the

HARTON COAL COMPANY,

LIMITED,

Newcastle-on-Tyne.

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Specific Gravity (Water 1)	1·276
Weight of One Cubic Foot	79·700 lbs.

PROXIMATE ANALYSIS.

Moisture in Coal	2·68 per cent.
Volatile Matter	35·60 ,,
Fixed Carbon	58·80 ,,
Sulphur	0·96 ,,
Ash	1·96 ,,

COMMERCIAL ANALYSIS.

Gas per Ton of Coal	11,760 cub. feet.
Gas per Cubic Foot of Coal	418 ,,
Illuminating Power	17·44 candles.
Value of One Cubic Foot in Sperm	418 grains.
Value per Ton of Coal in Sperm	703 lbs.
Coke per Ton of Coal	1367 ,,
Coke	61·05 per cent.
Ash in Coke	3·21 ,,
Sulphur Eliminated with Volatile Products per Ton of Coal	9·4 lbs.
Sulphur in Coke per Ton of Coal	12 ,,
Ammoniacal Liquor per Ton of Coal	19·7 galls.
Tar per Ton of Coal	12·2 ,,

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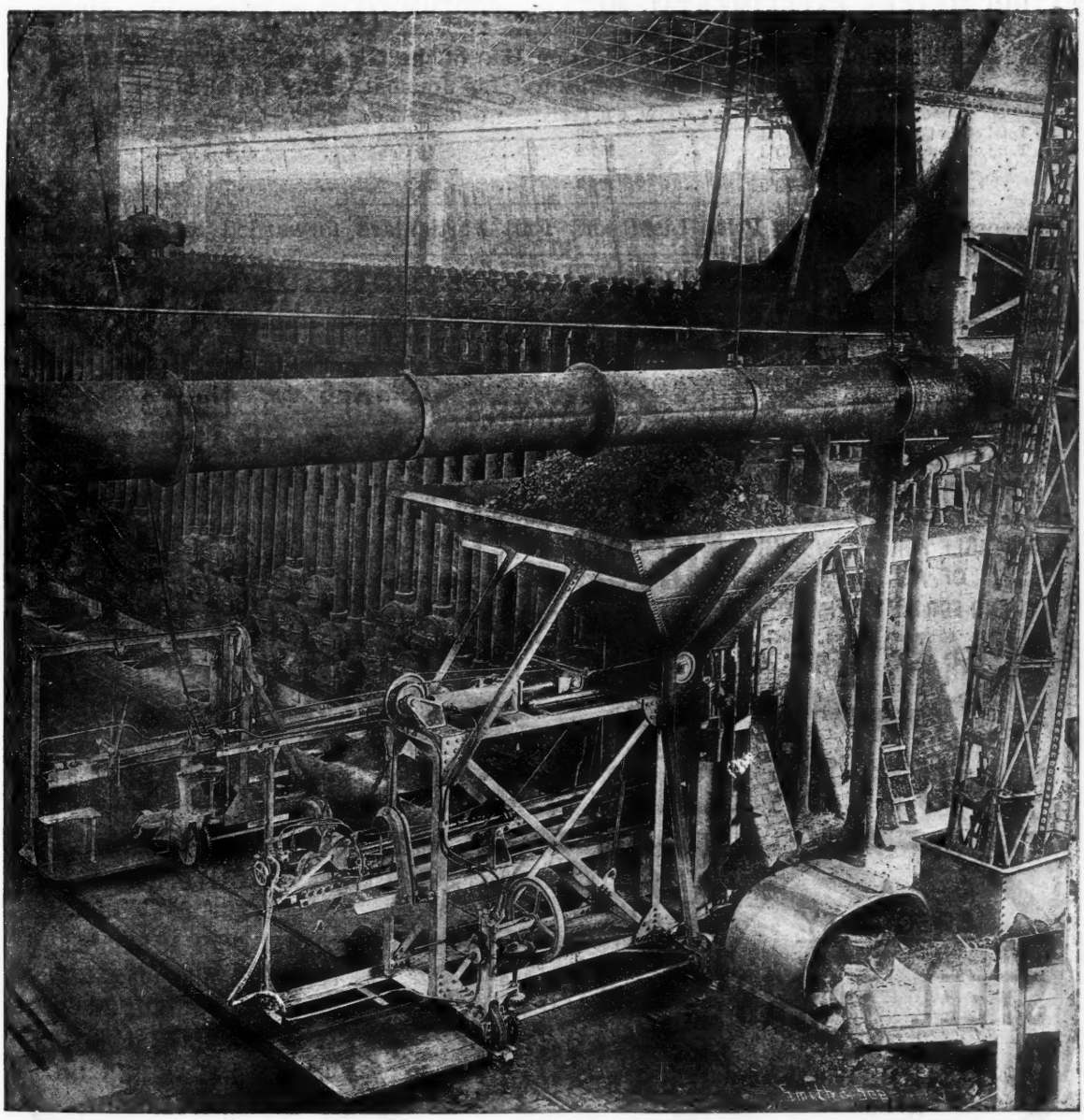

The above engraving shows the interior of a Retort-House at the Tradeston Gas-Works, Glasgow, where the Machines have been at work since the beginning of 1893, drawing and charging **960 Retorts every 24 hours. 79 Drawing-Machines and 52 Charging-Machines are at work, or in course of construction.**

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Total of Fast Tests . .	47·2 ..	6·9 ..	33·6 ..	62·3 ..	53·7
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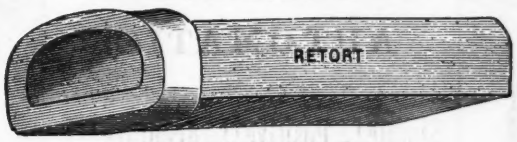

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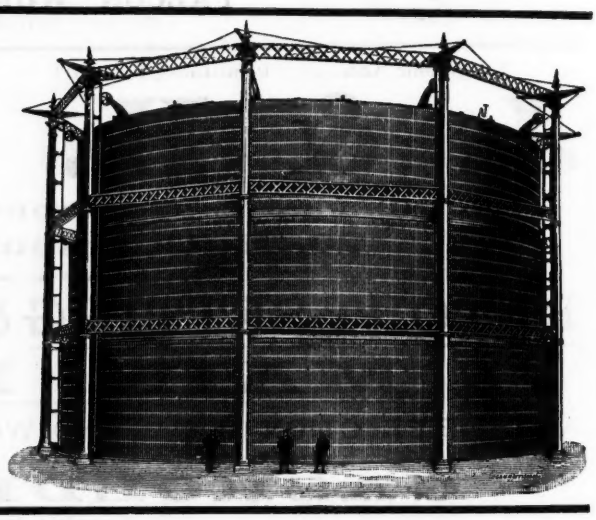

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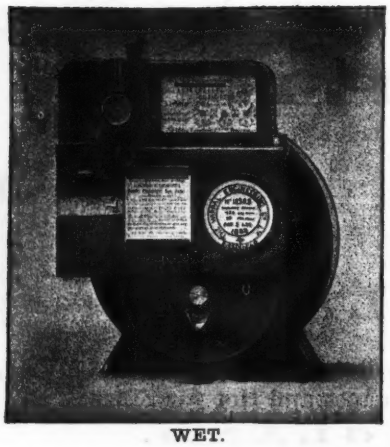

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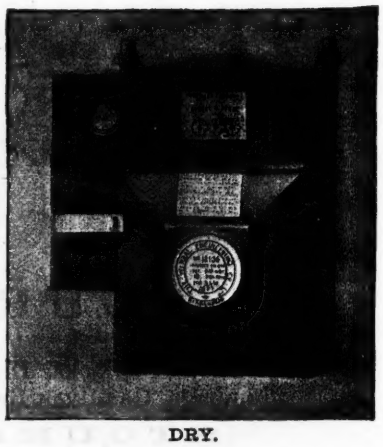

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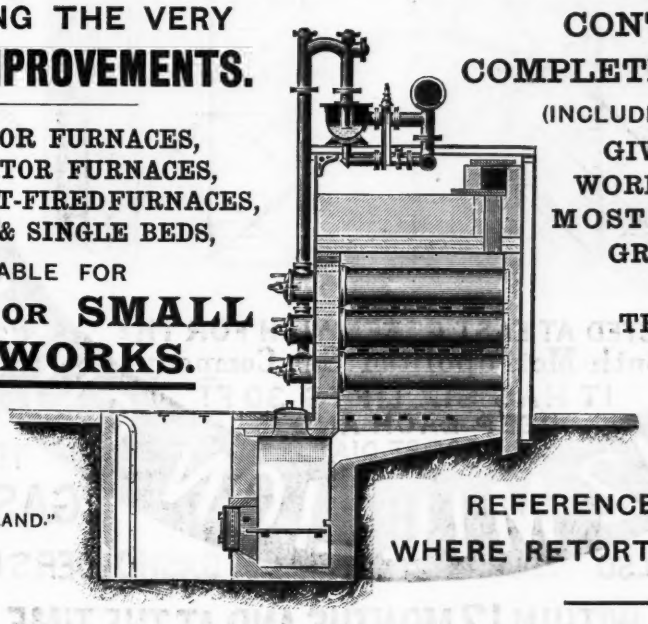

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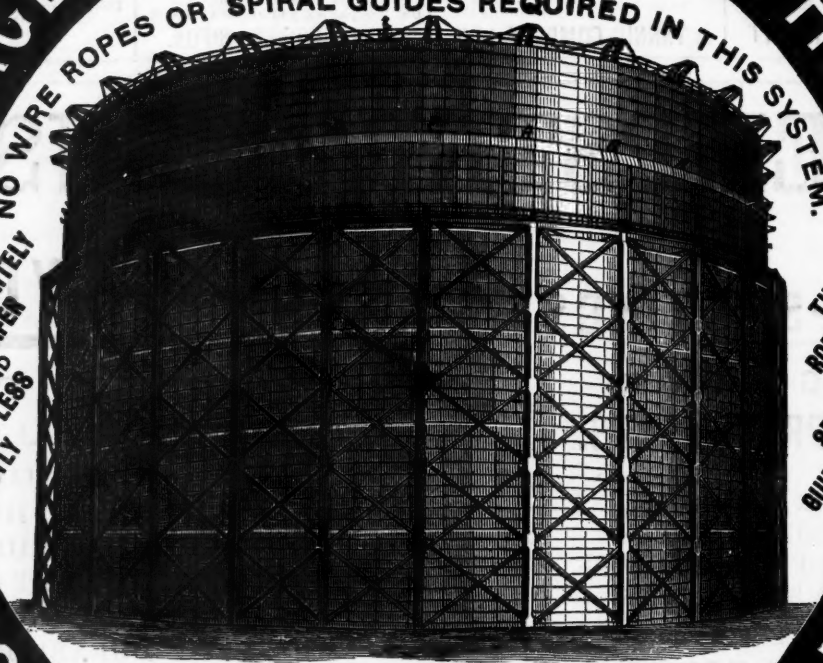

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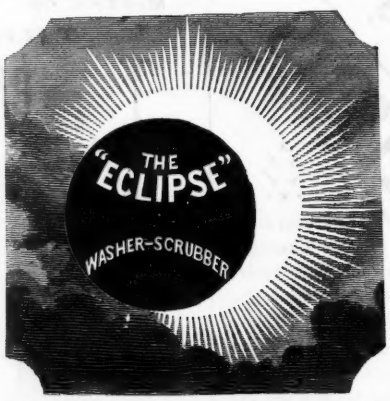

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